

FINAL Minutes of IHRA Steering Committee Meeting

Thursday, March 9, 2000
14.00 - 18.00
Meeting Room B
U.S. Mission
Geneva, Switzerland

Attendees:

Australia	Allan Jonas	Japan	Yoshiyuki Mizuno
Canada	Brian Jonah		Kazuhiko Morisaki
EC	Per-Ove Engelbrecht	Poland	Wojtek Przybylski
EEVC	Bernd Friedel	Sweden	Anders Lie
France	Bernard Gauvin	The Netherlands	Gerard J.M. Meekel
	Dominique Cesari	United Kingdom	John Jeyes
Hungary	Sándor Szabó		Richard Lowne
Italy	Claudio Lomonaco	United States	Raymond P. Owings
			John Hinch
			Julie Abraham

Agenda Items:

1. _ Call to Order & Introductions - Ray Owings
2. _ Review of Last Meeting Minutes - John Hinch
3. _ WG Reports
 - _ Side Impact (Australia)
 - _ Advanced Offset Frontal (Italy/EEVC)
 - _ Vehicle Compatibility (United Kingdom/EEVC)
 - _ ITS (Canada)
 - _ Pedestrian (Japan)
 - _ Biomechanics (US)
4. _ IHRA Completion Date
 - _ Scheduled for June 2001
 - _ Mid Term Corrections for IHRA - Report from Governments
5. _ WP29 Presentations
6. _ New Business
7. _ ESV Update - Gerard Meekel
8. _ Adjourn

Welcome & Approval of June 1999 Minutes:

IHRA Chairman, Mr. Raymond P. Owings, called the meeting to order at 14.07. He reminded the steering committee that Dr. Ric Martinez had left NHTSA, and that Dr. Martinez had told him that IHRA was playing an important role in automotive safety and that he wished them well. The Steering Committee was told that Transport Canada had a fatal accident at their automobile test facility. Brian Jonah provided some details for the Steering Committee.

Mr. Owings also indicated that Jim Hackney had retired from NHTSA. Jim had lead several research programs during his ten-year, which were related to automobile safety though the world, including the U.S. New Car Assessment Program (NCAP).

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Mr. Owings asked all the members to introduce themselves for the new members.

Mr. John Hinch, IHRA Secretariat, recorded the meeting. The Steering Committee was given time to review draft minutes of the June 1999, meeting. The minutes were approved with one minor addition. It was requested that the IHRA web address be added to the minutes. The approved minutes will be posted on IHRA Web site.

The IHRA web address is:
<http://www-ihra.nhtsa.dot.gov>

The June 1999 minutes will be posted on the web site in approximately one month.

Working Group Status Reports:

Steering Committee members with leadership responsibilities for IHRA Working Groups presented their Status Reports, as follows:

Side Impact:

Mr. Allan Jonas presented the IHRA Side Impact Working Group (SI-WG) Report. He handed out a new final page for the Side Impact report. A copy of his report is found in **Attachment 1**, which reflects the new page.

Discussion:

There were some discussions of the growing pains associated with the new working group. The relationship between the Biomechanics Working Group and Side Impact Working Group was reviewed. A document was introduced by Richard Lowne to describe how this group will coordinate with other groups. A copy is found in **Attachment 1.1**.

Advanced Offset Frontal

Mr. Claudio Lomonaco presented the Advanced Offset Frontal Group report. He also distributed a copy of the draft minutes from the most recent working group meeting. A copy of his reports are presented in **Attachment 2**. Mr. Lomonaco reported that much progress has been made and that he believed that this working group will be able to present some results in Amsterdam at the ESV conference.

Discussion:

There were some discussions on the two test speeds reported by Mr. Lomonaco. He explained that the higher speed test was for evaluation of vehicle intrusion and the lower speed was for air bag sensor test and evaluation.

There was a discussion of the status of the US's Advanced Air Bag Rule. Since the Rule was not final, the discussion centered around the Supplemental Notice of Proposed Rulemaking (SNPRM). NHTSA R&D developed two papers (each has an original version and an updated version) in support of this rulemaking, which are available on the NHTSA web site. They can be found at the following addresses:

http://www-nrd.nhtsa.dot.gov/airbag/advabg_rev.htm

IHRA Web Site: <http://www-ihra.nhtsa.dot.gov>

Select the following two papers to access the biomechanics research:

- Update: Development of Improved Injury Criteria for the Assessment of Advanced Automotive Restraint Systems II
- Development of Improved Injury Criteria for Assessment of Advanced Automotive Restraint Systems - September 1998

Select the following two papers to access the test procedures research:

- Updated Review of Potential Test Procedures for FMVSS No. 208
- Review of Potential Test Procedures for FMVSS No. 208 - September 19, 1998

The US maintains a public docket for all its rulemaking activities. These files are located on the Department of Transportation's Document Management System (DMS). The address for the search page, which will allow you to locate these files, is:

http://dms.dot.gov/search/search_form.asp

This brings up a search form within the DMS. Under agency, select "NHTSA," and fill the "CY" field and docket number box with the appropriate number per table below, and press the search button in the upper right. This will provide a list of documents related with that activity.

Action type	CY	Docket Number
FMVSS 208 SNPRM	1999	6407
FMVSS 208 NPRM	1998	4405
Advanced Air Bag Public Meeting	1997	2814

There was a general discussion on the status of the working group.

Vehicle Compatibility

Mr. Richard Lowne presented the report for the Vehicle Compatibility working group. A copy of this report is found in **Attachment 3**. He reported that the Compatibility working group had held three meetings since the last Steering Committee meeting, with the last meeting being in common with the Advanced Frontal Working Group meeting. He reported that there may be a combined approach between Advanced Frontal and Compatibility Working Groups.

Discussion:

There were some discussions regarding the need for the Side Impact and Advanced Frontal Working Groups to work together. Generally, it was thought that the Frontal efforts were ahead of the Side efforts, and that combining them would be very complicated. It was suggested that Frontal should be focused on first and then Side.

The Compatibility Working Group is working to develop tests that will improve compatibility without making frontal protection (self protection) worse. If the tests were similar, that would be a good goal. There were some discussions of the Compatibility Dialogue in Windsor and how that dialogue brought some of these discussion items to the front. It was agreed that the "safety

community” was moving away from the thought that incompatibility was “all mass,” and the distribution of vehicle stiffness was as important as mass.

Intelligent Transportation Systems (ITS)

Mr. Brian Jonah presented the ITS working group status report. A copy is found in **Attachment 4**. He reported that Ian Noy is the chair of the group and had prepared the report. He reviewed the objectives of the working group, including the eight key projects. See report for details on these items. Mr. Jonah discussed his concern over the lack of money to promote collaborative research, and that he was looking for partners. Finally he discussed the upcoming workshop, some contacts he had made with the EC, and that active participation still a problem within the ITS Working Group.

Discussion:

The United Kingdom and the Netherlands both expressed interest in becoming more involved with the ITS Working Group. Both countries were involved with ITS and stated they would increase their participation in the ITS group.

There was some discussion of consumer information for ITS systems. Mr. Lie said that Sweden was doing some work in this area. It was agreed by the Steering Committee that his area will be growing.

Pedestrian Safety

Mr. Yoshiyuki Mizuno presented the Pedestrian Safety Working Group status report. A copy is found in **Attachment 5**. There was one correction made by the members of the committee and Mr. Mizuno agreed to change his report to reflect the request. The attached report reflects the change. Mr. Mizuno indicated that they had held an expert meeting in Tokyo. He discussed the major efforts related to the working group activities, and that the working group had been looking for ways to improve its operation, such as using e-mail for communications, but thus far, that was not working well. Mr. Mizuno reported that progress was slow, but he felt that they were making a gradual step forward. He finished his report by asking what kind of report should we provide for ESV.

Biomechanics

Mr. Ray Owings reported to the Steering Committee that the Biomechanics Working Group had been active, holding 3 meetings since the last meeting of the Steering Committee. He reviewed the 5 elements related to the side impact request that the Steering Committee had charged the Biomechanics Working Group with in Windsor. A copy of the Biomechanics Working Group report is found in **Attachment 6**.

Mr. Owings then reviewed the US and Transport Canada’s plan for evaluating the Euro-SID II dummy. A copy of these slides are found in **Attachment 6.1**.

Discussion:

It was agreed by the Steering Committee that evaluation of ES-II was not an IHRA task, and was a bi-lateral issue to find an improved dummy for Canada and the US.

There was a discussion on the progress of the Biomechanics Working Group. Some members felt the progress was slow. The progress has been slowed because the US, who chairs the Working Group, has been very busy with recent activities related to its Advanced Air Bag

Rulemaking, the biomechanics issue is very complicated, federalization of dummies has taking a lot of time in the US, and the Biomechanics Working Group has spend a considerable portion of their time on the side impact dummy effort the Steering Committee asked them to investigate at the Windsor meeting.

There was a suggestion that the Steering Committee might need to review the progress of the Biomechanics Working Group. There were also some discussions as to whether the Working Group may be trying to do too much.

IHRA Completion Date:

Mr. Ray Owings started the discussion on the IHRA completion date. He reviewed the 1996 Australian Agreement, and then posed the following questions:

- 1 - Do we want to continue?
- 2 - Do we want to stop?
- 3 - Has IHRA been a benefit?
- 4 - Is IHRA effective for the cost?
- 5 - Is this the right way to spend our money?
- 6 - If we continue, what level do we continue at?

Several members suggested that the Steering Committee would need an up-to-date overview of the IHRA working group activities in order to make a proper review.

It was also agreed that a similar final status report would be needed for the upcoming ESV conference.

The Steering Committee made the following observations concerning the working groups:

- 1 - activities are at different stages;
- 2 - time scales are different;
- 3 - short comings exist due to personnel workloads;
- 4 - thus we need to have a summary to make a good decision on the IHRA activities.

The Steering Committee felt that the working group objectives may have been be overly ambitious; especially when one considers the real beginning of the working group's activities - that is, most of the working groups did not get started early in the process due to getting members lined up and deciding on a work plan.

The Steering Committee also felt if IHRA were to continue then a more realistic number of working groups should be selected and their missions should be reviewed more carefully.

After a lively discussion on IHRA and its results, the Steering Committee decided that a good review was needed. To perform this review, the Steering Committee members would need up-to-date status reports from the Working Groups.

The following schedule for drafting reports was agreed on:

- 2 weeks - to get out instructions (US)
- 4 weeks - inputs from countries on format (All IHRA Members)
- 6 weeks - final format for input (US)

IHRA Web Site: <http://www-ihra.nhtsa.dot.gov>

end of July - inputs for WG and Country reports (All IHRA members and Working Groups)

Items for consideration in the summaries:

1. Are we on the track we set for IHRA at the 15th ESV? (The IHRA Agreement documents are on the IHRA Web page)
2. Are we on the right approach for harmonized international research?
3. Were we too optimistic?
4. What benefits have derived from these efforts?
5. Each IHRA member country and Working Group should do a self assessment.
6. If we continue, what are the next steps?
 - a. Is a new group in data collection needed?
 - b. Should IHRA concentrate in areas where we can reach harmonization more quickly?
 - c. Should IHRA be taking a more serial approach (One research area at a time)?
 - d. How long should the next IHRA charter be?
 - e. How can we improve efficiency?
 - f. Should regulatory needs direct concentration areas for research?
 - g. How can we better focus on results?
 - h. Should research be selected that will bear fruit in short to medium term?
 - i. Does the IHRA Steering Committee need better tools for monitoring the Working Group's activities?
 - j. Should Work Shops be considered for future IHRA and/or Working Group operations?
 - k. Does IHRA have to lead to harmonized regulations to be a useful international tool?

The steering Committee suggested that a standard format should be developed for the Working Groups to use when reporting their results. The US will take this task.

It was suggested that the committee members review the 16th ESV papers and those submitted for the 17th ESV to assess the harmonized research.

The following observations were made:

“IHRA research is a “bottoms up” effort, while WP 29 is a “top down” effort.”

“IHRA leads to a harmonized foundation”

Mr. Lomonaco's principle “The silent agree”

WP29 Presentations

The Steering Committee discussed the possibility of the IHRA presenting results from its working groups to the WP29. Several members suggested that this sharing of data would be useful for WP29 and the GRs. The WP29 consists of the following GRs:

GRE Working Party on Lighting And Light-signaling
GRRF Working Party on Brakes and Running Gear
GRSP Working Party on Passive Safety
GRSG Working Party on General Safety Provision
GRPE Working Party on Pollution And Energy
GRB Working Party on Noise

The consensus of the committee was:

- 1 Make technical reports to the GRs. These reports should be done by the countries who lead the individual Working Groups. GRSP, GRSG, and GRRF were discussed as possible candidates for presentations by IHRA Working groups.
- 2 Provide an overall IHRA report to the WP29 after the June 2001 conclusion of the current IHRA program.

The Steering Committee suggested that the United States take the lead on this effort.

New Business:

Next Meetings:

November 2000:

The Committee agreed to continue to meet Thursday afternoons during the week of every other WP 29 meeting. Thus, the next Steering Committee meeting will be in November 2000, at the US Mission. The IHRA Secretariat will coordinate arrangements.

Early 2001:

The Steering Committee felt that it should add a meeting in early 2001 to discuss final results prior to the ESV meeting in June 2001. It is possible that this meeting could be held with the WP29 meeting in March 2001.

June 2001:

We are tentatively scheduling a meeting for the Sunday prior to the start of the 17th ESV.

SAE

The Society of Engineers International (SAE) contacted NHTSA to see if NHTSA would be willing to give them the 16th ESV attendee list so they could offer them a SAE Occupant Protection Technology Collection on CD-ROM which contains over 650 SAE technical papers (1975 - 1999) covering the design, analysis, and performance of safety systems that interface with the passenger. The Steering Committee agreed **NOT** to give the attendee list to SAE for this purpose.

ESV Update

Mr. Meekel led a discussion regarding the ESV meeting planned for June 2001. A copy of his presentation is found in **Attachment 7**. He asked that all the Steering Committee members publicize the call for papers.

The meeting was adjourned at 18.15 hours.

IHRA Web Site: <http://www-ihra.nhtsa.dot.gov>

A copy of the current roster of IHRA members is found in **Attachment 8**.

Attachments:

- 1 Side Impact Status Report
- 1.1 Coordination document presented by Richard Lowne
- 2 Advanced Frontal Status Report
- 3 Vehicle Compatibility
- 4 ITS
- 5 Pedestrian
- 6 Biomechanics
- 6.1 Evaluation Plan for the Euro-SID II Dummy
- 7 ESV Update
- 8 IHRA Roster

End of Report

Prepared by: John Hinch
IHRA Secretariat
April 4, 2000

PROGRESS REPORT

INTERNATIONAL HARMONISED RESEARCH ACTIVITIES SIDE IMPACT WORKING GROUP

FEBRUARY 2000

INTRODUCTION

The IHRA Side Impact Working Group (SIWG) has met twice since the last report to the Steering Committee in June 1999. Meetings of the IHRA Biomechanics Working Group (BWG) and ISO WorldSID Task Force have been held back to back wherever possible. The work of these three groups is closely linked and there has been a great deal of cooperation between them.

PROGRESS OF SIDE IMPACT TEST PROCEDURE

Australian/Canadian Parametric Study

Members were advised of the outcome of a cooperative project between the Australian Department of Transport & Regional Services and Transport Canada to examine the parameters of mass, stiffness and geometry of the moving deformable barrier (MDB) on injury outcome.

The following conclusions on injury outcome were drawn from the test series:

- . Increasing the barrier ground clearance from 300mm to 400mm has the greatest effect on injury outcome.
- . Increasing the mass and stiffness of the barrier only has a marginal effect.

These conclusions are supported by similar parametric studies done by the Insurance Institute for Highway Safety involving vehicle-to-vehicle tests, the Transport Research Laboratory using computer simulation and some preliminary tests conducted by Transport Canada.

These findings have important implications for the possibility of developing a harmonised test procedure:

- The conclusion that the ground clearance of the barrier face is the most important parameter means that the trolley mass and barrier stiffness could be harmonised despite the different mix of vehicles in the fleet around the world.

- A lower ground clearance of 300 – 350 mm could represent a predominantly passenger car fleet.
- A higher ground clearance of 400 – 450 mm could represent a predominantly SUV or minivan fleet such as the USA.
- Regulatory authorities can then decide whether to prescribe 2 tests or opt for testing a worst case scenario at one ground clearance.

Non-Struck Side Occupants

Accident studies have indicated that at least one-third of injuries and fatalities occur to non-struck side occupants. Members have agreed that a re-evaluation of accident data would be required to address the issue of non-struck side occupant injury and quantify its significance.

Outstanding Issues

A “brainstorming” session was conducted during the 2nd day of the San Diego meeting in November 1999 to identify what specifications in the draft test procedure still needed to be resolved. Members could then commit resources to conducting tests to finalise these. The issues identified are:

- Whether the impact configuration should be crabbed or perpendicular.
- Whether the deformable barrier element should be homogeneous or not. This issue is linked to the impact configuration as a number of non-homogeneous (European type) element designs fail in shear when used in a crabbed mode.
- Whether there is a need for a rear dummy.
- Whether there is a need to mitigate injuries to non-struck side occupants.
- How the issue of head injury protection in side impacts can be dealt with since, in the MDB test, the dummy head rarely makes contact with anything.

PROGRESS OF TEST DEVICE

The ISO WorldSID Task Force has met 3 times since June 1999. These meetings have finalised the specifications for the development of a mid-sized adult male WorldSID _-prototype. Following some delays, it is now expected that the _-prototype will be ready for initial evaluation to biofidelity requirements by November 2000.

The WorldSID Task Force has reiterated that its funding and development resources are on the mid-sized adult male test device. Therefore it has been agreed that the development of a small adult female test device would need to be proposed to ISO WG5. In the meantime, it has been suggested that SID IIs could be used.

SUMMARY

1. The IHRA side impact test procedure is expected to consist of the following:
 - Moving deformable barrier (MDB) crash test
 - Vehicle to pole crash test
 - Out of position static test(s) for side airbags
2. The mass and stiffness of the MDB have limited effect on injury risk on occupants of the target vehicle.
3. The conclusion that the ground clearance of the barrier face is the most important parameter means that the trolley mass and barrier stiffness could be harmonised despite the different mix of vehicles in the fleet around the world.
4. All stakeholders need to commit sufficient resources for testing to resolve outstanding issues in specifying the test method.

FUTURE MEETINGS

Date	Place	Comments
7/8 Feb 2000	Madrid	Following IHRA Vehicle Compatibility and Advanced Offset Frontal. BWG (11 Feb) and WorldSID Task Force (9/10 Feb) follow.
12/13 June 2000	London	After the Vehicle Safety 2000 Conference.
16/17 October 2000	Australia	After WorldSID workshop

Keith Seyer
Chair
13 January 2000

RESPONSIBILITIES OF THE IHRA SIDE IMPACT AND BIOMECHANICS WORKING GROUPS AND THEIR INTERACTIONS WITH WorldSID

INTRODUCTION

The IHRA Side Impact Working Group (SIWG) is charged with the coordination of international research activities that would enhance the possibility of the development of a harmonised side impact test procedure or procedures. The terms of reference of the SIWG are at Attachment 1.

The result of the coordinated research activities of the IHRA SIWG is expected to be a recommended test procedure or procedures, based on accident analyses, impact testing and experiences with current regulations. These recommendations would include a proposal for the dummy size and seating locations.

The IHRA Biomechanics WG has been charged with collating the available information on anthropometry, biofidelity performance requirements and injury criteria for side impacts. This information will also guide the development of WorldSID and the choice of dummy and injury criteria for the test procedure(s) being developed by the SIWG.

The WorldSID project is tasked with developing a mid sized adult male test dummy. The time frame to develop WorldSID is given in Attachment 2. It is guided by the IHRA SIWG and BWG in its work. A statement regarding the current status of side impact dummies is given at Attachment 3.

INTERACTION OF THE IHRA SIWG AND BWG WITH WorldSID

The SIWG and BWG were tasked to review the latest available real world crash data to prioritise injury mechanisms and identify associated crash conditions. This would define the full range of impact conditions to which the dummy or dummies would be subject under the proposed test procedure(s) and to specify the injury types and body regions for which injury criteria would be needed.

Both of these WGs have worked closely with the WorldSID Task Group to ensure that they are fully aware of the progress on the development of the test procedures and dummy sizes likely to be proposed for use in the test procedures. Likewise, the WorldSID Task Group is committed to close coordination with the SIWG and BWG. The WorldSID Task Group timeline has been adjusted to integrate the activities of the SIWG and BWG. The WorldSID Task Group has indicated its intention to meet the requirements of the SIWG and BWG.

The SIWG has kept the BWG fully informed of the anticipated test conditions under which it is required that the dummy should perform well.

The BWG should be responsible for developing the biofidelity requirements for the side impact dummy or dummies under the conditions specified by the SIWG. In addition, the BWG should be responsible for recommending the injury criteria to be used with the proposed dummy. It will be possible to translate these into performance criteria only once the dummy has been selected and is available for testing.

Once the stage for defining the dummy or dummies has been reached, these two WGs should jointly be responsible for the evaluation of WorldSID and any other dummy considered to be a potential world harmonised side impact test dummy.

The BWG should be responsible for coordinating the biofidelity, durability, repeatability, reproducibility, anthropometric qualities and other dummy performance requirements.

The SIWG should be responsible for validating the performance of the dummy or dummies in the test procedures, probably as part of the overall validation of the proposed side impact test procedure. A joint recommendation of the selection of the side impact dummies for use in the proposed IHRA side impact test procedures can *then* be made.

CURRENT SITUATION

The degree to which full harmonisation can be achieved is not clear at this stage but it seems certain that the resulting test procedures will include a dynamic impact of a mobile deformable barrier into the target vehicle which will contain one or more dummies. There will also be a vehicle to pole test as real world crash data points to these as being the two most prevalent crash types.

While it is possible that the vehicle fleets in different continents are sufficiently different that the test procedure may differ in some details for the different legislative jurisdictions, the humans inside the vehicles will not differ to the same extent. Thus at least the dummies and, potentially, the injury criteria could be harmonised.

ATTACHMENT 1

IHRA SIDE IMPACT WORKING GROUP: TERMS OF REFERENCE

Co-ordinate research worldwide to support the development of future side impact test procedure(s) to maximise harmonisation with the objective of enhancing safety in real world side crashes. This would include:

- . Review of real world crash data to prioritise injury mechanisms and identify associated crash conditions taking into account likely future trends.
- . Taking into account the need to protect both front seat and rear seat(s) adult and child occupants.
- . Interaction with the IHRA Biomechanics Working Group to monitor the development of harmonised injury criteria.
- . Interaction with the IHRA offset frontal and vehicle compatibility working groups to ensure solutions in one area do not degrade safety in another.
- . Monitor and, as appropriate, provide input to the development of WorldSID and any other side impact dummy.
- . Possible additional component or subsystem test procedure(s).

Target date for draft proposal of test procedure(s) is 2001 ESV.

ATTACHMENT 2

Was not provided

SIDE IMPACT DUMMIES – CURRENT SITUATION

There currently exist two side impact dummies that are specified for use in legislative side impact testing, US-SID specified in FMVSS 214 and EuroSID 1 specified in ECE Regulation 95 (and a variant of US-SID in FMVSS 201). At least five other dummies have been designed and built specifically for use in side impact testing, the most prominent of which are BioSID and SID IIs. There is now extensive activity, coordinated by ISO/TC22/SC12/WG5 and sponsored by the world automotive industry, aimed at producing a new generation side impact dummy that could be accepted world wide, known as WorldSID. The intention is to develop a practical dummy based on the most recent biomechanical data that could potentially be specified for use in any current or future side impact test procedure.

SIDE IMPACT DUMMY REQUIREMENTS

The dummy or dummies installed in the test vehicle must be suitable for use under the range of test conditions that could be experienced in the test procedure for which it will be specified. There are several qualities that the dummy must have, including biofidelity (ie. it must react in a human-like way), durability, repeatability, reproducibility, anthropometry etc. and it must be capable of measuring injury risk in the test. These issues are addressed in the WorldSID design specification.



Rome, 24/11/99

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IHRA Working Group on Advanced Offset Frontal Crash Protection.

Please find here enclosed the minutes of the fifth meeting of the Working Group, held in Berlin on 8-9th July 1999.

Sincerely yours,

Claudio Lomonaco

INTERNATIONAL HARMONIZED RESEARCH AGENDA (I.H.R.A.)

Rome, 24/11/99

STATUS REPORT ON THE ADVANCED OFFSET FRONTAL CRASH PROTECTION GROUP

(Based on the results of the meeting held in Berlin on 8-9th July 1999)

Participants: C. Lomonaco (Chairman, Ministry of Transport of Italy), R. Lowne (EEVC), A. Lie (EEVC), K. Seyer (Federal Office of Road Safety Australia), A Hobbs (IHRA Compatibility), D. Vetter (Technical University of Berlin), P O'Reilly (IHRA, Compatibility), T. Hollowell (NHTSA), K. Oki (JAMA), G. Nusholtz (OICA), P. Fay (ACEA/OICA), E. Gianotti (Secretary of the Group).

DISCUSSION ON THE AGENDA OF THE MEETING

1. Extension to vehicle of category N1 (1st step)

EEVC:

According to WG16 accident studies, about the possible amendments to the front impact test procedure, EEVC proposes a first step for goods vehicle up to 2.5t. It is not proposed to include vehicles greater than 2.5 tonnes until there is an effective compatibility test.

In any case this study is submitted to the conclusions of the IHRA compatibility group.

NHTSA:

Reported that the agency has included light duty vehicles (i.e., pickup trucks, vans, and sport utility vehicles) up to 8,500 pounds for testing according to FMVSS No. 208 and frontal offset barrier procedures. Even for the light duty vehicles, agency is evaluating the opportunity of testing with 5% unrestrained female dummy using the European offset deformable barrier test procedure.

JAPAN

In Japan for current type approval full frontal crash testing, goods vehicles up to 2.8 tons are included already.

JMOT is evaluating to adopt frontal offset deformable barrier to the J-NCAP, but not for type approval at this moment.

2. Type of barrier

NHTSA

Reported that further evaluation will be carried out to try to define the geometry of the future car fleets. Cells under the deformable parts of the barrier are placed to assess the impact forces. The Agency is trying to finalize a multipurpose barrier. The intention of the agency is to deem a barrier with changing elements in order to adapt it step by step to the vehicle model changes.

Also stiffness is under study. A uniform stiffness is the opposite of the reality, particularly in the case of the offset impact.

EEVC

Is no longer in favor of the trolley test. Trolley mass must either be fixed or it must match that of the tested vehicle but it seems at the moment rather difficult to see significant advantages over the fixed barrier. From considerations of compatibility, the trolley test seems to be inferior.

According to their studies also the angle of impact does not introduce any advantage in the test.

Japan

Reported that they have stopped studies concerning the tests using vehicles with different weights at varied collision speeds.

3. Impact speed.

EEVC

Gave no further information regarding this item.

USA

The Agency deems to split the test in two procedure:

- A low severity procedure at 40km/h
- A high severity procedure at 60km/h with 5th percentile unbelted dummy.

Anyway no conclusions have been yet reached on this issue, so this first approach would probably change in the next future.

Australia

Has views for a 64km/h test speed, as a first step. Anyway the delegate advocates to consider the effects of compatibility before reaching any conclusion.

With regards to the second step, the research is not yet established.

4. Performance Criteria.

EEVC

According to conclusions of the last meeting Mr. Lowne subsequently drafted a document AFC 22a, in which injury criteria and instrumentation requirements are listed. This document was revised by the experts at the meeting The table contained in the revised document is proposed to the group members for review, using the most recent accident analyses, so that recommendations can be based on the requirements for the draft test procedures (see doc. AFC 22a attached to the minutes)

Conclusions

For the next meeting the members are invited to collect:

- statistics and other factors available to justify changes
- priorities for the revised list

subsequently these data will be shared with the compatibility group.

5. Air-Bag performance

NHTSA

The delegate informed about the progress concerning the test. Recently the agency performed 10 further tests, data on these are not available, but a draft supplementary note will be published shortly.

Anyway substantial criticism about Combined Thorax Index (CTI), as a good discriminator between more aggressive and less aggressive air-bags, arose in this last tests and the Agency will provide a more complete answer next time.

OICA

Chrysler will introduce the analyses system that it has developed.

With regard to the noise effect, induced by the Air-Bag, they are studying some models.

EEVC

While the EEVC is expecting to consider the undesirable effects of airbags related to injury, such as out of position effects, it would be unlikely to include toxicology or noise. With reference to collateral effects, Mr. Lowne suggested a new working item for the next meeting to put into the agenda concerning the Collateral effect of Air-Bag explosion.

NHTSA

Presented on the behalf of the Insurance Institute of Highway Safety a study regarding the seating position for 50th percentile male Hybrid III. The findings indicated that the driver dummy clearance from the air bag module was less than 250 mm for a number of vehicles. NHTSA indicated that the issue of dummy positioning would be considered over the near future.

6. Impact angle.

EEVC

The angle of impact influences the structure. The EEVC views have not changed on this issue. The angle is exclusively related to a trolley test. This last induces problems in repeatability. It is more practical than theoretical to have an angle test.

NHTSA

There are no news on this issue. It should be fixed up to 20°. A paper concerning the last news on this definition should be delivered within August.

OICA

Have no clues to suggest anything on this item. OICA advocates a rigid barrier than an angle barrier, because it is better to set the Air-Bag.

NHTSA

Is also in favor of an offset test to represent different kind of accidents, to test the vehicle structure and to demonstrate the effects of mass.

OICA

Says that two regulatory tests involve two different barriers and technological complexity.

7. Trolley

NHTSA

The major issue related by the trolley test is the compatibility.

EEVC

Insisted to decide as soon as possible to use or not the trolley test.

The table concerning the Trolley based Frontal Offset Impact Test procedure, was slightly changed as follows:

ADVANTAGES	ALTERNATIVE APPROACH TO ACHIEVE SAME ADVANTAGE WITH FIXED BARRIER
1. The acceleration pulse, DV and energy distribution is representative of real world serious injuries.	No known alternative.
2. Takes into account the effects of the Mass Ratio of the vehicles.	Change impact speed with vehicle mass.
3. Can include angular effects on the deformation and intrusion characteristics.	No known alternative.
4. Can include a possible measure of Compatibility (by, for instance, measuring the vehicle and/or trolley acceleration)	Measure the force on the fixed barrier behind the deformable face.
DISADVANTAGES	POSSIBLE ACTIONS TO REDUCE THE DISADVANTAGE
1. Complex test procedure for “moving barrier-moving car” (such as high speed trolley bounce. Possible overriding and others).	<ul style="list-style-type: none">_ Reduce complexity by testing co-linearly and/or_ using moving barrier to stationary car. Explore methods of reducing artificial overriding.
2. Repeatability of more complex test may be poor (for angled moving barrier-moving car)	
3. Difficulties to video record impact effects between trolley and stationary car during the development of the vehicle.	Mount the camera on the vehicle
4. Limited number of test laboratories with capability to perform trolley-to-vehicle testing.	Minimise the complexity of the test and/or improve capability of test institutes.
5. Unknown ground and other interaction effects, especially if one vehicle stationary while the other travels at higher speed – to represent both vehicles moving.	Investigate
6. Need to agree on a harmonized barrier mass, stiffness and geometry when vehicle fleet differ internationally.	Agree to differ

8. Conclusion of the meeting

Discussion during the meeting had demonstrated clear differences of opinion regarding the use of a fixed or mobile barrier for the offset test, particularly regarding the influence on compatibility as well as on “self protection.” In an effort to help in resolving this issue, the chairman on the IHRA Compatibility WG invited members of the Advanced Offset frontal crash protection WG to attend one day of the next two day Compatibility WG meeting to be held in San Diego. It was agreed that those members of the Frontal WG who were able to attend would participate in the discussions on Friday Oct 29th. Which would be devoted to the topic of the merits of fixed and mobile barriers. Mr Lowne agreed to produce a discussion document to assist with the discussions.

It was advocated by several members of the group that a formal joint meeting with the compatibility group should subsequently be held. A day of overlap of the meeting of the two group will be fixed in the next convocation.

The date of the next meeting is scheduled on 16-17th November 1999 in Delft (Holland) by TNO.

LIST OF CLASSIFIED DOCUMENTS

- **IHRA/AFC-22 Injury Assessment R Lowne [EEVC]**
- **IHRA/AFC-23 Standard Seating Position for 50th Percentile Male Hybrid III (Adrian Lund)**
- **IHRA/AFC-24 Frame and Body characteristics of motor vehicles for carriage of goods (Japan Type Approval Handbook – Safety Regulation).**

4/3/00

INTERNATIONAL HARMONISATION OF RESEARCH ACTIVITIES - COMPATIBILITY WORKING GROUP

Chairman's Status Report for IHRA Steering Committee on 9 March 2000

Nominations and Attendance

Industry has been represented from the fourth meeting with industry delegates attending from Japan, Europe and normally the USA.

Members from the IHRA front and side impact groups are often represented either by invitation or through membership of both groups. In addition IIHS representatives were invited to present research information at the sixth meeting and an ad-hoc meeting in the USA. Since the last report there have been three meetings, the sixth in Berlin (6-7 July 1999), an ad-hoc meeting in San Diego (28-29 October 1999) and the seventh in Madrid (1-2/3 February 2000). The ad-hoc meeting was held after the Stapp conference.

Co-operation with EEVC WG15

The longer established EEVC WG 15 was formed in February 1996. Representatives from NHTSA and European industry attend WG 15. Currently the chairman of the IHRA group attends EEVC meetings where the organisation and timing of the IHRA and EEVC meetings are linked. This trial linking, with a common session for technical presentations continues to prove very beneficial and was the format for four of the last six meetings, the recent exception being the ad-hoc meeting in the USA.

Linking with other IHRA groups

The sixth meeting was held back to back with the IHRA Frontal Impact Group and the seventh meeting included the first common session with both groups.

The ad-hoc meeting in San Diego was mainly devoted to receiving information and deciding on advice to the IHRA Frontal Impact Group which has asked about its possible interest in the use of a mobile deformable barrier for compatibility assessment.

Other links

EUCAR: Links continue with EUCAR as Dr Zobel, a group member, also heads the European industry EUCAR project on compatibility. This has resulted in members of the IHRA group being invited to two workshops - the joint EUCAR and EEVC workshop on accident analysis (8-

9 February 1999) and the coming EUCAR and EEVC workshop on Crash test results (28-29 March 2000) in Germany.

USA: The initial “open” part of the ad-hoc meeting- (October 1999) was attended by an additional 24 representatives from USA, Japan and Europe.

Next meeting and links

An ad-hoc meeting will be held on 30 March 2000 directly after the EUCAR/EEVC workshop.

The following IHRA compatibility meeting in England, on 14-15 June 2000, will be back to back with the IHRA front and side impact meetings. In turn this series of meetings is adjacent to an IMechE Vehicle Safety 2000 Conference in London; the latter includes a session on compatibility.

Overview of Member's Positions

The USA (NHTSA) continues to have an extensive programme for compatibility research. The approach taken is based on studying accident statistics to determine the extent of incompatibility in the US vehicle fleet, using computer modelling techniques to characterise and represent the demographics of the fleet and the pattern of accidents. It investigates areas where changes to vehicle characteristics and/or test procedures could have the best effect in reducing casualties.

At earlier meetings NHTSA presented updated data on aggressivity in the fleet. There was a disproportionately high risk of fatalities to car occupants from LTVs (light trucks and vans) in car front and side impacts. SUV data was now grouped by size showing large SUVs to be more aggressive than small SUVs. Recent reports included a breakdown of injury patterns in car to car and car to LTV accidents.

NHTSA continues with the development of the systems model of the fleet, using Madymo models developed for representative vehicle types; it can be exercised with these or modified vehicle characteristics in different impact conditions e.g. speeds, occupant size, seating locations, restraint configuration. Development of FE models is advancing and these will be exercised in different crash modes to validate/support this approach. The number of vehicles being modeled using FE has been increased by initiating work on a further SUV.

NHTSA has presented earlier analyses of load cell wall data from US NCAP tests and has started to develop load cell equipped MDB testing. In addition a range of crash test results have been outlined to the group both for car to car/SUV and barrier results.

The EEVC WG 15 work has been partly funded by the European Commission from July 1997; this research has now been reported to the Commission. At the seventh meeting, the chairman of the EEVC WG 15 briefly outlined in general terms the broad findings of the EEVC work programme. This programme included a literature review, accident analysis (drawing on in-depth studies and general accident data to try to quantify the incompatibility problems), a structural survey to create a data base of the geometrical properties of new car models on the

European market, modelling and car crash tests. The EEVC chairman will seek Commission approval to send copies of the contract report to the IHRA group.

Presentations have included TNO on MADYMO modelling both for parametric studies and optimisation of car characteristics to minimise injury. The modelling work includes the use of MADYMO models linked to FE models provided by NHTSA, some of which relate to cars on sale in Europe. FE work has also been carried out by TRL. Outline presentations on Flat, TRL and INRETS and BAST crash testing results have been made. Briefly, the front impact tests covered car to car (50% overlap, 56 kph), car to OBD (40% overlap, 64 kph), car to full width rigid barrier (56 kph) and car to full width defonnable barrier (56 kph). Most of the ODBs were with EEVC faces but a few used ADAC faces. Tests are being cam'ed out by TRL using a small car to SUV. These are likely to be extended to include car to MDB tests. A car structural survey and an initial analysis of fatal and injury accidents was presented earlier.

Japan presented information, based on police data. It indicated, for example, that the relative risk in a minicar to car accident was appreciably greater for a minicar driver. But this data was for a period before Japanese standards were increased for minicars. Crash investigation cases indicated that in frontal impacts, full and 30/40% overlap were dominant. This augmented earlier separate data on accident levels for RVs; while drivers of cars are more likely to be injured in collision with RVs, such accidents were a small part of the total accidents. Test work has included car to MDB frontal tests at 112 kph. The MDB was found to be more severe than an ODB. Over-riding of the car by the barrier was noted and was more pronounced with the FMVSS 214 barrier face. The MDB will continue to be investigated.

Future work is likely to include car to ODB tests with the barrier face at different heights and further car to car test(s) at different ride heights.

Canada has no specific compatibility programme but considered that their side impact work may provide useful information. Accidents were being examined to find cases of low injury severity in severe impacts and AIS 3+ injuries in minor impacts and the implications for the side impact test. They are also looking at side impact airbags.

It is expected that the Canadian research over the next year or two will concentrate on side impact. However, as the IHRA compatibility work progresses, they will look at the proposals.

Canada has previously reported that LTVs were a growing part of the Canadian fleet.

Request from Frontal Group: At the July 1999 session, the Frontal Group asked the Compatibility Group about the possible interest in an MDB for compatibility assessment. This was the dominant topic in the following ad hoc meeting in San Diego; presentations and discussion in a wider group were followed by an IHRA only session. The MDB was not seen as an essential prerequisite to control compatibility. The avenues discussed ranged from an MDB approach (with potential variations) to an approach which specified the vehicle performance more directly by using geometry/ energy/ force considerations monitored by a fixed barrier with load cells. Views differed on the exact type and number of tests e.g. high speed test only or an energy/ force management package. In the case of the MDB, issues were experience with over-

riding of the car, and whether this was realistic, plus repeatability would be important for Europeans in particular. The US accident data indicated that a MDB test would offer the best coverage of US accidents overall, in particular considering self protection. NHTSA sees the MDB as the focus of its research bearing in mind primarily self protection in frontal crashes but EEVC has developed no interest in the MDB for compatibility although there had been some evaluation.

A document reflecting the views in the IHRA group's round table discussion was fed back to the Frontal Group.

Prospects for Harmonisation

It was always envisaged that the working group would look initially at the effects of compatibility in the car field, but always making sure that any conclusions took account of the effects on other types of vehicle. However there is a clear difference in the mixture of vehicle a full width rigid barrier (with a thin deformable face) and a high resolution load cell wall, with a view to controlling homogeneity and therefore structural interaction. ODB tests were included with a view to controlling force time history. For side impact, INSIA carried out car to car tests (50 kph) examining the effect of bullet vehicle height. For both frontal and side impact, some tests were carried out with modified cars with more homogeneous fronts.

The EEVC members plan to develop a further project aimed at an expected Commission (5th Framework) call in mid 2000. In the meantime, there will be a fall off in EEVC research although there may be some Commission support for interim work. Fortunately a few individual EEVC members have national research funding for work; this can continue independently; for example, ongoing TRL and BASt or INRETS activity would be available to the EEVC. It is anticipated that a new EEVC project would focus on the development of potential test procedures and would also include elements on further accident analysis, modelling, crash testing and possibly structural analysis.

The number of laboratories with, or introducing, a load cell wall is set to increase considerably in 2000.

One concept outlined in more than one quarter is a possible high speed overload test aimed at structural behaviour.

The European industry (EUCAR) project will be completed around the end of 2000. It concentrated initially on accident studies; these proved inconclusive with no clear statistical relationships found. Based on their accident data, they had grouped some factors as “compulsory” and others as “possible.” Crash testing followed, exploring selected aspects and may continue into mid 2000. CHECK The workshop on 28/29 March will focus on the results.

IIHS presented an analysis of US accident patterns, showing that occupant fatalities decrease with increasing mass but that the rate is slower for cars than UVs. This was linked to a high incidence of single vehicle accidents. UVs were more aggressive than similar mass cars, a

difference which was greater in side impact. Overall, IIHS considered self-protection to be the most important factor.

IIHS also reported on side crash test results where a 2000 kg target car was impacted by different bullet vehicles where both were moving. The front structure of the bullet vehicles tended to shift sideways and this effect was also found in a subsequent check on a selection of accidents. It also reported on the effect of changes in individual car designs which reduced passenger compartment intrusion; the conclusion was that stiffness was not increasing in the early stages and the overall decelerations were similar, with increasing acceleration only being seen towards the end of the impact.

In the US industry, Ford are carrying out car to car frontal tests with both vehicles moving using a similar configuration to tests carried out by NHTSA. The use of a blocker beam on a large LTVs was noted. GM also reported on some side impact model work at the ad-hoc session.

The Australian fleet is moving to a higher proportion of small and large cars relative to medium cars. Pickups and LTVs sales are relatively large (about 25%). Australia has also reported on a parametric study of side impacts in which changing the MDB mass did not have a major effect, stiffness was of limited importance and geometry had the greatest influence. A series of frontal (50% offset, 50 kph) crash tests were being completed on large to small car, large car to SUV and types in use in North America compared with Europe and Japan with Australia in an intermediate position. In particular, the high incidence of LTVs in the US and Canada has relevance to compatibility. This variation in car fleets has required the IHRA group to consider a wider group of vehicles than was originally planned in the EEVC WG 15 work for Europe.

Representatives have been encouraged to think about the shape of possible testing methods so that this can help form views on current efforts and plans, and influence the research work.

Conclusion

Progress has been made on the early stages and the range of modelling and crash testing results available should widen considerably in 2000.

Finding common methods to evaluate and control compatibility which could confidently deliver quantifiable casualty reductions in different continents remains a complex task. Much remains to be done and it is not likely that a definitive solution is achievable around 2000. But It remains possible that a worthwhile interim method may be identified.

In future, possible avenues may include: better homogeneity and alignment to offer improved interaction of energy absorbing structures, control of dynamic crush characteristics to keep the occupant cell within tolerable deformation and deceleration limits over a reasonable range of mass ratios and; in the case of side impacts, ensuring engagement at sill and A and B pillars and limiting the degree of intrusion or the risk of head contact due to higher impacting structures.

....vse6_00/compat/status report 9 March 2000

IHRA COMPATIBILITY WORKING GROUP MEMBERS

(last update February 2000)

Note. Not all members attend the meetings.

Mr Peter O Reilly (UK - Chairman)
DETR

Prof. Adrian Hobbs (UK - Secretary)
Transport Research Laboratory

Mr Keith Seyer (Australia)
Federal Office of Road Safety

Mr Dainius Dalmotas (Canada)
or Deborah Collard
Transport Canada

Dr Tom Hollowell (USA)
NHTSA

Mr George Neat
Volpe Center (USA)

Mr E Faerber (EEVC)
BASt

Miss Adalian/ Dr D Cesari (EEVC)
INRETS

Mr Kazuo Oki (Japan)
represents OICA, JAMA, Ministry of Transport

Mr Yoshiharu Kadotani
JAMA (Japan)

Mr Koji Mizuno (Japan)
Ministry of Transport

Dr R Zobel OICA
Volkswagen AG

Dr Priya Prasad OICA
Ford USA

Dr Jerzy Wiclici- (Poland)
Institute of Vehicles
Warsaw University of Technology

International Harmonized Research Activities - Intelligent Transport Systems Progress Report March, 2000

Introduction

The IHRA Intelligent Transport Systems Working Group's goal is to develop procedures (including methods and criteria) for the evaluation of safety of in-vehicle information, control and communication systems with respect to human performance and behaviour. To date, surveys have been conducted on relevant research underway in different countries and several workshops have been held. Results of national research have been shared. The WG continues to search for appropriate mechanisms for collaborating in joint research. A number of priority research areas have been identified as a first step and current efforts are focused on how to implement a program of collaboration in these priority projects. Progress has been slow, however, and it is clear that the mandate of the WG will need to be extended beyond the original 5-year period established in order to meet the goals of the IHRA program.

Recent Activities

Working Group Meeting

The most recent Working Group meeting was held in Stockholm, Sweden, October 19, 1999. Progress in each of the priority projects was reviewed (see below). It was noted that the database of interested organizations was not complete and, in particular, no response was received from the UK or the Netherlands. Consequently none of the Dutch or British research organizations are represented in the current database. It was agreed to update the list of interested research organizations for each of the priority projects. Project leaders will then contact potential partners to explore and determine appropriate mechanisms for collaboration.

The following is a summary of the key issues discussed under each project:

. **Project 1: Development of a Harmonized Safety Evaluation Methodology Framework (Worldwide)** *LEAD: D. Augello:* In the absence of Mr. Augello, A. Pauzié suggested that Project 1 could build on previous EU project HARDIE. It is necessary to update HARDIE, and focus on techniques that can be used for predicting safety. Then, partners would have an opportunity to comment on the applicability of techniques identified, advantages and disadvantages. Further research may be warranted to validate or further develop certain techniques. A. Pauzié will discuss with D. Augello and prepare an outline for Project 1. Dr. Friedel indicated that Germany will participate in this project and is seeking partners for collaboration. Dr. Schulze from BAST will be the German scientific authority.

. **Project 2: Driver Understanding And Expectation of ITS Systems: Identification And Measurement Of The Effects of False Expectation of Driver Performance** *LEAD: I. Noy:* I. Noy indicated that TC is planning to investigate issues associated with ACC safety. The possibility of TC collaboration with NHTSA using NADS was suggested and will be explored. A. Burgett to provide information about the Michigan FOCAS project.

. **Project 3 Human Factors Principles Checklist For In-Vehicle Systems** *LEAD: B. Friedel & C. Patten:* Title changed to "Human Factors Principles Checklist for In-Vehicle ITS Status Report, March 2000

Systems.” Project will be co-lead by C. Patten. WG members commented that the use of a checklist is subjective and may be difficult for governments to implement. The checklist is viewed as a first screen to identify areas where further evaluation may be required. The workshop following the WG meeting explored the utility of checklists for developing consumer product information.

- . **Project 4 Normative Data On Naturalistic Driving Behavior** *LEAD: A. Burgett:* No specific items were discussed related to this project.

- . **Project 5: Simulator Reference Test Scenarios** *LEAD: C. Patten :* It was suggested that this project might be extended in the future to include test track reference test scenarios.

- . **Project 6: Improved Secondary Task Methodology For Evaluating Safety Effects Of Driver Workload** *LEAD: K. Hiramatsu:* I. Noy described the computer-based attention model developed by VPI (T. Dingus) for FHWA. I. Noy will attempt to distribute to WG members copies for beta testing.

- . **Project 7: Harmonization And Validation Of Surrogate Safety Measures** *LEAD: A. Burgett:* This project is highly related to projects 4 and 6 but will be kept as a separate project with A. Burgett as project leader. I. Noy described joint research with NHTSA using an eye tracking system (Vision 2000) to investigate the effects of Auto-PC on driving.

- . **Project 8 Dormant: Driver Learning, Retention, & Acceptance Of New ITS Systems: What We Can Learn And Problems To Avoid** *LEAD: B. Friedel:* This project will be dormant for the time being as it has lower priority.

Lack of funding continues to be a major impediment to developing a long-term plan of collaborative research. However, there was encouraging news. Germany has indicated that some money has been allocated to project 1. New research results obtained from the U.S. Intelligent Cruise Control Field Operational Test were presented to the group.

The next Working Group meeting will be held in Lyon, April 12-13, 2000

IHRA-ITS Safety Checklist Workshop

A group of about 20 road safety experts participated in a workshop on October 20-21, 1999. The purpose of the workshop was to evaluate the usefulness and relevance of the TRL “Safety Checklist for the Assessment of In-Vehicle Information Systems”. The workshop participants were divided into groups of 3-4. Each group used the TRL checklist to evaluate the Travel Pilot navigation system (standard package), using Teleatlas Intelligent Maps. The trials were held in downtown Stockholm traffic using six Audi A6 vehicles equipped with the on-board navigation systems. The groups were given some brief training on the checklist and navigation instructions. After the two-hour driving trials, the groups reconvened to compare results.

The workshop clearly indicated that checklists are beneficial in identifying potential safety problems and can be used as a diagnostic screen in the safety assessment of in-vehicle information systems. The results thus generated can be elaborated and used as the basis for disseminating consumer-oriented information and they can also be used to identify the need for

more detailed investigations. The workshop also identified a plethora of issues associated with practical testing and evaluation that need to be further addressed. The results of the workshop were transmitted to TRL for consideration in the final revision of the document. We are grateful to the participants for their contributions.

Meetings with representatives of the European Commission (EC)

Discussions held with representatives of DGXII and DGVII on November 11, 1999. WG members present included Ian Noy, August Burgett and Kaneo Hiramatsu.

We first met with Mr. Ika Lumiaho of DGXIII (Information Society: Telecommunications, Markets, Technologies - Innovation and Exploitation of Research). DGXIII projects emphasize scientific and technological innovation, or deal with harmonization. Each project funded by EC needs to demonstrate contribution to standardization (guidelines for system architecture, specifications or user needs), but there are no planned projects dedicated to safety standards or methods to evaluate risks and benefits of ITS. However, DGXIII would consider horizontal projects (i.e., across applications) on safety evaluation, and may contribute more than the normal 50% funds for such projects. This possibility needs to be further explored. The EC call for projects scheduled for the Fall of 2000 will cover transport and ITS, especially in areas of sensors, enhanced applications and technologies. Mr. Lumiaho suggested that IHRA-ITS WG could make direct contact with European car manufacturers or research institutes to offer the possibility of collaboration in creating new project proposals (for Fall 2000 call).

It was also suggested that IHRA-ITS WG consider a series of workshops, or consultation meetings, in European member states to discuss WG interests and methods of collaboration. Collaboration with IHRA would enhance the quality of consortia. It was suggested that workshops should be held during the period August to October in advance of the Call to promote the interests of WG. These workshops could be hosted by member states represented in the WG (e.g., Netherlands, France, Sweden, etc.). It was suggested that the WG also consider Brussels as a venue. DGXIII is prepared to facilitate partnering opportunities by posting IHRA bulletin on their web site. However, they have no database which contains all potential organizations.

We also met briefly with Mr. Keith Keen of DGVII (Transport). The purpose of the meeting was to introduce the IHRA-ITS WG goals and activities and express our interest in collaboration with DGVII. Mr. Keen was very receptive and indicated he would put us in contact with René Bastiaans and Datler Gerhardt who are more directly involved in road safety. Contact is being formally established.

Future Activities

Research Projects

Project leaders will contact potential partners to determine the feasibility and most appropriate method of collaboration in their project area. A guideline for these discussions was produced. Project leaders will each produce study plans, including definition of studies to be undertaken, timelines and specific partners, prior to the next WG meeting in April.

ITS Assessment Program.

WG participation in the Swedish ITS SafeTE project will continue with a view towards contributing to that project and developing standardized procedures that could be implemented more widely in NCAP-type crash avoidance protocols.

Issues for Consideration by the IHRA Steering Committee

Active participation by WG members remains an issue, though we are hopeful that contact with the European Commission and the current project-based approach will result in a more tangible work program.

IHRA/PS/SR/5

**ESV/IHRA PROJECT
PEDESTRIAN SAFETY
STATUS REPORT
V**

MINISTRY OF TRANSPORT, JAPAN

March 9, 2000

1. [Introduction]

This report describes the activities concerning IHRA/Pedestrian Safety that have been conducted since the report was submitted to the IHRA Steering Committee on June 24, 1999.

2. [Report on Activities]

The fifth Pedestrian Safety Experts meeting was held in the JASIC Conference Room in Tokyo over a three-day period from September 15 through 17 of 1999. At the meeting, information was exchanged and specific testing methods were examined.

A total of 17 people participated in the meeting. Among these were experts selected by the governments of Australia, EU (EEVC), Japan and the U.S., experts selected by OICA and observers from the Ministry of Transport, Japan; the Traffic Safety and Nuisance Research Institute, and elsewhere.

2-1) Exchange of Information with Various Countries on Pedestrian Safety

(1) EEVC

It was reported that of the impactors currently under development by the EEVC/WG17, improvements continue to be made on the head impactor and the leg impactor.

(2) United States

It was reported that NHTSA gathered information on 593 cases from Pedestrian Crash Data Study (PCDS) and established a database covering 292 cases. The two methods of headform test by ISO and EEVC were also evaluated.

(3) Australia

Of the EEVC test methods (old methods), the head and leg test methods were used to perform tests on 10 Australian vehicles.

As a result, the optimal values of some of the vehicles cleared required values, but the worst value appeared to be exceedingly high and not one vehicle cleared required values at all locations with both test methods.

It was also reported that the NCAP test was started using the EEVC test method.

(4) Japan

There was a report on shock tests using the windshield and adult head impactor. The latest results of analysis of pedestrian accidents in Japan were also reported.

(5) JAMA

The state of progress in development of pedestrian dummies by Honda R&D was reported.

(6) ACEA

The EEVC WG10 test method (old method) was checked based on a computer simulation of TNO, and it was reported that measures for adults have adverse effects on children.

2-2) Updating of Accident Investigations by Various Countries

In addition to the updated accident reports from each country presented above, the following topics were discussed.

(1) Summary of accident surveys

NHTSA proposed format unification based on the format reported from Japan. It was decided that collision speeds, pedestrian injury sections, locations of vehicle contact resulting in injury, and other information would be summarized in uniform format by each country (England, Australia, France, Germany, Japan, the United States). Based on this information, the vehicle speed to be covered by the test method is determined. There were deliberations but no conclusion was reached.

(2) Definition of passenger vehicle

In Japan and Europe, gross vehicle weight (GVW) is set at 2.5 tons, while in United States, it is 3.2 tons or less.

Vehicle shape was discussed. By the end of December surveys of front and side views will be conducted by JAMA, AAM and ACEA, and results will be compiled at ACEA. Based on these results, points affecting test methods will be discussed.

2-3) Test Tools and Evaluations

Japan made proposals concerning the test tools currently in use and evaluations of the same, and deliberations were held based on these proposals.

NHTSA has a free motion headform for FMVSS No. 201, and an evaluation will be made with this added. In each evaluation, there should be a foundation and evidence for reaching the conclusions, and information on the same will be exchanged and final conclusions drawn. Since there is no explanation of the foundation upon which the EEVC reached its decisions, provision of information will be requested. Final conclusions will be reached after all this information has been compiled.

In particular, information on hand impactor and leg impactor, items of high priority, is needed urgently.

2-4) Test Procedures

Japan proposed test procedures for adult and child head tests and for adult leg tests. It was decided that subsequent deliberations would be held based on these procedures.

In the head test method for adults, it was decided to add the vehicle window screen, reflecting accident conditions. It was agreed that Japan will study amended proposals in conjunction with the same.

2-5) Injury Criteria and Threshold

NHTSA introduced the relationship between HIC and injury risk curve.

ACEA pointed out that in evaluation of injury value in headform test, the HIC correction factor must be considered, and this point was discussed. It was decided, however, that ACEA will compile more detailed proposal materials, which will be examined at the next session.

2-6) Computer Simulation

NHTSA, JARI and the University of Adelaide (Australia) will cooperate in conducting verifications and comparisons of computer simulations which reproduce pedestrian accidents. It was decided that, with the results thus obtained (about three cases), further investigations will be made at the next session.

3. Assignments for Each Country

Accident data from England, Australia, France and Germany will be compiled and presented in a uniform format. (Europe, Australia)

FMVSS No. 201 free motion headform data will be added to the test tool table. (NHTSA)

Adult head impactor mass and other evidence will be submitted. (EEVC)

Survey report of passenger vehicle shape (side view). (3 auto industry associations of Japan, Europe and United States)

Proposal of methods for reflecting in test methods the vehicle front view shape and testing conditions. (All participants)

Clarification and report of the basis of test conditions for the EEVC/WG17 headform certification test. (EEVC)

Determination of the need for the HIC correction factor in evaluating injury values in the headform test, and provision of data materials. (ACEA)

Provision of samples (about 3 cases) for verification and comparison of computer simulations reproducing pedestrian accidents. (NHTSA, JARI, University of Adelaide)

Formulation of opinions on methods of summarizing reports. (All participants)

4. Future Schedule

The sixth experts meeting is scheduled to be held in Washington D.C. (NHTSA) from March 14 through 17, 2000.

Thereafter, experts meetings will be held two or three times up to the ESV Conference in 2001, and a report to the ESV Conference will be compiled.

5. Upcoming Activities and Problems

- a) There has been considerable delay in implementation of the initial plan. Among conceivable reasons for this delay are the following: 1) It has taken a long time to gather data on accident analyses; 2) The assessments and decisions of experts are required in reaching final decisions, but there have been no explanations of evidence for making such decisions

- b) It had been agreed that studies and information exchanges would be carried out by e-mail or fax, etc., because meetings are held too infrequently, but no information was provided by the due date, not even for assignments. Operations could not be administered smoothly. When e-mail was sent, for instance, responses were poor.
- c) Deliberations have begun on summarizing the contents of reports to the ESV Conference in 2001. If the Steering Committee has any advice, it would be appreciated.

International Harmonized Research Activities

Status Report

of the

Biomechanics Working Group

Rolf H. Eppinger, Chairman

February 28, 2000

Activities Since Last Status Report (June 16, 1999)

The Biomechanics Working Group met three times since the last Status Report. The meetings were held in Sailuf, Germany on July 12, 1999 in conjunction with a WorldSid meeting; in Lyon, France on September 27-28, 1999 following the IRCOBi Conference; and in San Diego, California on October 28, 1999 following the Stapp Car Crash Conference.

The Working Group continued to concentrate its efforts on completing its major charge, developing the specifications for a universal side impact Anthropomorphic Test Device. Specific areas of pursuit included: 1. Definition of the world-wide side impact crash problem using available crash data bases, 2. Anthropometric characterization of the involved crash victims, 3. Biofidelic impact response specifications that appropriately characterize human side impact responses, 4. Appropriate dummy evaluation methodologies, and 5. Review and evaluation of proposed injury criteria and their associated performance limits. The attached minutes from each of the meetings provide details of discussions and individual member efforts in each of the technical areas.

The next meeting of the Working Group is being proposed to be held in Washington, D.C. in latter part of April, 2000. It is hoped that continued progress towards the goals of the group can be made. The Working Group realizes that it

has not been able to deliver a draft report to the Steering Committee as requested. This is a result of two things: the true enormity of the total effort and the limited time and effort individual Working Group members have found they are able to devote to these specific pursuits. An assessment of the Group's status and best estimate of its task completion date will be made at the April meeting in Washington D.C. and reported to the Steering Committee.

While the Working Group continues to concentrate on its primary task at hand, it has also discussed what it thinks its role should be relative to various advanced frontal impact dummy development programs. This will remain an agenda item until an agreed to strategy is developed.

Respectfully submitted,

Rolf Eppinger, Chair.

Attachments:

Minutes of July, September, and October meetings

International Harmonized Research Activities (IHRA)

Biomechanics Working Group

Draft Minutes of Meeting held at ACTS, Sailuf, Germany July 12, 1999

Attendees:

Rolf Eppinger	Chair / NHTSA
Dainius Dalmotas	Transport Canada/Canada
Dominique Cesari	INRETS/EU/EEVC
Keith Seyer	FORS/Australia
Risa Scherer	WorldSID Task Group
Toru Kiuchi	OICA/ Japan
Hideki Yonezawa	JMOT/ Japan
Takahiko Uchimura	JAMA (observer)
Kazuhito Asakawa	JAMA (observer)
Haruo Ohmae	JARI (observer)
Michiel van Ratingen	TNO/ EEVC
Steve Rouhana	GM/ USA
Suzanne Tylko	Transport Canada/ Canada

Opening of Meeting:

A status report for the Biomechanics Working Group was presented to the steering committee June 24, 1999 in Geneva.

The steering committee is expecting a final report in November.

Review of Previous Minutes:

Draft minutes for the meeting held May 15, 1999 in Kyoto Japan were distributed by Dainius Dalmotas.

Amendment: Section 5 Injury Criteria Review

Closing sentence should read "Consideration will be given to the ISO Working Group 6 output" as requested by D. Cesari.

Corrections: Attendance & Address list

The name entry for Mr. Yanagisawa should be listed as Mr. Harushige Yanagisawa.

Minutes were accepted as amended.

Presentations:

Anthropometry

Keith Sayer presented summary tables of anthropometric distributions derived from the Jurgens database, desegregated by sex and percentile group (5th, 50th, 95th percentiles). The Jurgens database, (currently referenced by the EVC) contains anthropometric data from 20 geographical regions and accounts for secular trends to the year 2000.

Confidence intervals were not be calculated due to the extent of extrapolation used to fill in missing data;

Body mass was not included as a parameter.

Mr. Sayer compared:

Unweighted mean percentile values by sex across 20 geographical regions;

Mean percentile values by sex weighted by regional population;

Unweighted mean percentile values by sex across 10 geographical regions containing OECD countries;

Mean percentile values by sex across 10 geographical regions containing OECD countries weighted by population;

Mean percentile values by sex across 10 geographical regions containing OECD countries weighted by road fatality rate.

Discussions ensued pertaining to the significance of observed differences and the need for a robust argument to support and /or rationalize any proposed changes.

It was agreed that Michiel van Ratingen (TNO) would input selected parameters from the Jurgen data into the Ramses programme and proceed as follows:

A weighting factor will be derived based on the proportion of population groups in Jurgen's raw data (currently in-house at TNO);

This weighting factor will then be applied to the existing population groups in the Ramses data set consisting of German data n=6000, Japanese data n=6000, and US/ Canadian data n=6000;

Mass and sitting height values from the Jurgen database will be entered as input to the Ramses programme to generate a full complement of anthropometric parameters for comparison with Jurgen's data and current dummy anthropometry;

Model output will be sent to the Chair & distributed to members for discussion and comments;

Anticipated time for completion of the exercise is approximately one week. Mr. van Ratingen will pursue this task upon his return to TNO.

WorldSID Update

Risa Scherer provided an update on the WorldSID project.

The design team held an initial kick-off meeting at FTSS. and is meeting the afternoon of July 12 '99.

Revised proposals for the shoulder / thorax and abdomen are expected to be presented at the WorldSid Task Group meeting July 13, 1999.

Design specifications are expected to be frozen at this time.

The task group is anxiously awaiting the anthropometry results.

3.- Field Accident Data

A copy of the SID2000 draft report (DOC #) was provided to Mr. Dalmotas by Mr. van Ratingen for his review. Volvo side airbag cases still need to be added.

Copies of the report will be distributed to committee members by Dainius Dalmotas.

4.- Biomechanical Data

Rolf Eppinger emphasized that the greatest responsibility lies in dummy load fidelity.

Head:

Input from members was requested to help set priorities for planned cadaver testing at the University of Wisconsin later this year. Critical loading regions on the head need to be defined. Data from the Wisconsin test series is expected by the end of the year.

Neck:

Predominant role is in the proper positioning of the head.

Biofidelity in frontal flexion / extension should be included if possible.

Discussion:

Mr. van Ratingen reminded members that TNO needs to know what corridors should be met (NBDL data still needs to be reviewed by TNO).

Rolf Eppinger advised that members of the working group will have to answer the question of appropriate corridors to be met; suggestions regarding recommended method to process time histories are also needed.

Resa Scherer suggests that the Alpha prototype be run through 9790 as a starting point with additional tests being included if necessary; WorldSid will run ISO tests then IHRA can run its tests.

Dominique Cesari reminded the group of the importance of having IHRA oversee all tests (8 sets). The priorities of the working group must remain independent.

Rolf Eppinger commits to providing a preliminary set of requirements to be distributed among members for comment. The document will be finalized at the September meeting.

The process was accepted by all members.

5.- Injury Criteria Review

Dominique Cesari has not received any contributions to date.

ISO WG6 documents i.e., document no. 463 Pelvis, no. 480 Thorax, no. 492 Abdomen & Thorax have been reviewed and will be used to set injury risk curves.

At this time it is not clear how one can proceed to develop a single set of injury risk functions for a specific body region.

The AIS ≥ 3 injury risk function for thoracic deflection is different for the impactor test and the sled test. These differences must be addressed.

Biomechanical references are lacking for the head, neck and thigh, contributions are needed.

Arm repeatability is also a problem.

Discussion

Rolf Eppinger favors sled testing stating that the energy transfer observed in sled testing is closer to what is actually seen in vehicles. The thoracic and abdominal injury criteria are currently being examined by NHTSA.

D.Cesari has started preparing a report describing injury functions for the pelvis, abdomen and thorax.

The near side vs. far side issue needs to be revisited. Originally, focus was to be near side only but there may be a need to have simultaneous right and left side measurement capabilities.

Each major region should bring forth their requests.

6.- Other Business

A document prepared by Bud Mertz (DOC #) was distributed to members by Steve Rouhana.

GM has inquired as to the authorship of the IHRA document. Rolf Eppinger explained that while the document would be reviewed by others the document would be authored by government bodies.

Discussion re. the benefits of sled vs. pendulum tests

Dainius Dalmotas does not believe that the sled test is more realistic than the pendulum test. He explained that within the accident environment concentrated loads are created. Therefore there is a definite need to supplement sled tests with localized loading.

Rolf Eppinger stated that this is the intention however, the pendulum test can be shown to have different energy transfers. The sled test with a pelvic lead should address the localized load deficiency.

Mr Dalmotas agrees that the sled modifications are improvements. However both sled and pendulum tests are required if the dummy is to respond in a realistic fashion.

Keith Sayer agrees that both sled and pendulum tests are required.

Rolf Eppinger questioned whether the modified sled tests would be redundant if pendulum tests were also included. If a pendulum test employs a 6" diameter impactor what size offset plate would be sufficient to represent the pendulum test ?

Risa Scherer reminded the members that repeatability is better with the pendulum test.

Dominique Cesari explained that the impactor provides continuous localized loading while the sled creates momentary localized loading. He favors the sled test as a priority. Drop tests should have the lowest priority.

Rolf Eppinger concluded the discussion by suggesting that he prepare a set of specifications derived from sled tests, for circulation among members. Members are asked to include justifications with their submission.

Discussion of response corridors:

A brief discussion was held concerning the merits of including severe/ catastrophic injury versus non-injury in the response corridors. No consensus was reached.

Next Meeting(s)

It is anticipated that the next meeting of the WG would be held in Lyon on or about September 27-28, 1999 and in San Diego on or about October 28, 1999.

All representatives were reminded to resubmit all relevant documents previously tabled to the Secretary so that proper document numbers can be assigned.

Close of Meeting

International Harmonized Research Activities (IHRA) Biomechanics Working Group List of Delegates

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International Harmonized Research Activities (IHRA)

Biomechanics Working Group

Draft Minutes of Meeting held at INRETS, Lyon, France September 27-28, 1999

Attendees:

Rolf Eppinger	Chair / NHTSA
Dainius Dalmotas	Transport Canada/Canada
Dominique Cesari	INRETS/EU/EEVC
Steve Moss	FTSS (observer)
Risa Scherer	WorldSID Task Group
Farid Benjallal	OIAC
Koshiro Ono	Japan
Jac Wismans	EU/EEVC WG12
Suzanne Tylko	Transport Canada/ Canada

Opening of Meeting:

The chair welcomed the delegates.

1. Acceptance of Previous Minutes:

Draft minutes for the meeting held July 12, 1999 in Frankfurt, Germany were distributed by Dainius Dalmotas.

Corrections: Keith Seyer's name was corrected throughout the document.

Under 'Other business' GM was replaced with B. Mertz.

Dominique Cesari moved to accept the minutes as amended and the motion was carried.

2. WorldSID Update (Risa Scherer)

The project is now fully funded.

The design specifications have been frozen and the clarifications completed. There are 194 total non-redundant channels (includes fully instrumented legs and arms)

Alpha evaluation will be conducted by Transport Canada and NHTSA.

Europe is interested in participating at least in part, in the evaluation of the a-prototype. SID 2000 has supported the development of the a-prototype.

Application deadline for submissions for funding to support evaluation of the WorldSID from the European commission is Dec.15 with reply expected by March 15.

The plan would be to send the a-prototype to Europe after evaluation at TC and NHTSA is completed. Some coordination would be required to avoid replication of tests.

a-testing will include all ISO biofidelity; glazing/packs; IHRA tests that may have been derived and specified.

Asia will run biofidelity on the b-prototype.

Meetings: SID 2000 meeting planned for October 15 to look at pelvic design;

WorldSID meeting is November 1 in San Diego;

WG5 meeting November 5 in San Diego;

3. WorldSID Design progress report (Steve Moss)

Chest

Spine box will be central rather than rear mounted and the mass will be concentrated to lower inertial spikes. A one piece spine was selected over multi-segmented spine for calibration reasons.

UMTRI Anthropometry database used as a starting point: 1983 study identified a 24.6° angle for the back as measured between T8 and L5;

Biomechanics Status Report, March 2000

Modeling included single rib, 10kg spine box, 6.7m/s impact with a 2.4 kg pendulum 75mm deflection (impactor motion): generated maximum strains of 2.2 to 3.3% and 2400N loads. Oblique loading 30° from the front results in maximum strain of 2.3% and highlights deflection measurement issue;

Compared to Wayne State chest band work; model indicates rotational motion of the spine box which is more cadaveric; dummy will need a pivot point or hinge at sternum.

Top three ribs will be connected to the sternum and deflection stops will be included;

Shoulder

Preliminary math modeling had been completed for the shoulder;

Damping material to be used will be equivalent to the standard damping material employed in the Hybrid III;

Need 3 loading conditions for sternum: pure lateral deflection >100mm from outside arm; pre-test positioning and shoulder motion for static airbag tests;

Achieving the desired lateral deflection and static deployment capabilities may prove difficult (impossible) with a single shoulder design

Plan is to design to meet lateral deflection only and provide an alternate shoulder for static deployment. ROM requirement for biofidelity would require a 2 year time frame. Shoulder development may have advanced sufficiently for inclusion into the b-prototype.

Anticipated deflections are as follows:

Arm (20-30 mm); shoulder (70-75 mm) for a total deflection of 90-105 mm.

The deflection path is through the glenoid-humerus joint and involves primarily lateral motion.

The clavicle will likely be plastic based.

Abdomen

Two additional ribs have been added (ribs 4-5);

Abdominal bulge will be modeled in foam;

Lumbar Spine

3° increment setting, similar to THOR;

Increased lateral bending;

Inclusion of an extensible cable (rubber or spring) to allow spine to extend;

Offset support posts to assist in positioning, disappear during the dynamic phase;

Instrumentation

64 in-dummy data acquisition possible with 2 x 32 channel DAS slide-in modules;

Pre-wired harness, no protrusions rearward;

Option to plug in at umbilicus;

Arms and legs will be independent with an umbilical;

IR track can be incorporated for each rib, (also linear pot option, 2 per rib);

IR track length is 150 mm (6 in) gimble is mounted to center.

Comments and thoughts are solicited.

4. Anthropometry report (Steve Moss)

DOC [1] Comparison Between Jürgens, UMTRI and RAMSIS Data (Hoofman, Hapee, van Rantingen for EEVC-WG12) circulated; DOC [2] is a copy of presentation made to WorldSID.

Tabulates body measurements for the 50th percentile male and 5th percentile female using Jürgens (analyzed & presented in July by Keith Seyers); UMTRI; RAMSIS US/ Canada; RAMSIS US in-house; RAMSIS German; RAMSIS Japan/ Korea; RAMSIS Japan in-house. UMTRI data was reworked to produce a set of 147 points (55 symmetric); generated a full surface model.

SAE Aspect Program ASIS is shifted, and there is too much flesh under the pelvis, H-point is repositioned 10.4 mm lower 2 mm forward, back angle line L5-T8 24.6°.

Comparison of UMTRI stickman to RAMSIS by matching/ overlapping surface landmarks and joint centres.

Differences in the pelvic angle between RAMSIS and UMTRI, no lordosis in UMTRI

Upper arm lengths differ

Table DOC [1] Base dimensions are similar across all sources

Discussion:

Extensive discussions ensued regarding the feasibility of relying on UMTRI data to represent all population groups;

Rolf Eppinger recalled a study where moments of inertia and masses were found to have less than a 10% effect on response;

Jac Wismans drew attention to an earlier study published in the last ESV proceedings where they looked at extreme sizes in the typical population from RAMSIS and found that injury criteria was greatly affected. Parameters included upper, mid and lower limits for depth/ length/ seating height resulting in 27 categories.

Farid Benjallal stated that when they were designing their head restraint systems they had to choose each extreme and centre point for each category.

At the moment we seem to have an internally consistent data set, does this still apply when you move away from the 50th percentile male or average person;

The committee must decide between the selection of a 50th percentile male or person. Since the 50th male is in the middle of the distribution adding the 50th female will bring down the average/ median value.

The field data as pointed out by Dainius Dalmotas indicates that the 50th male is at greatest risk of pole impacts while the 5th female represents the cut off for seating positions.

Conclusion

Committee will provide specs for a small, mid and large size dummy for November;

Current UMTRI is acceptable for the mid size dummy;

Further meetings are required to propose anthropometric guidelines for the child dummies;

Tasks

Farid Benjallal will provide a communication with documentation pertaining to positioning i.e.; what is feasible

Comparison of UMTRI with Jurgens for the 95th percentile (Jac Wismans);

Verification of data values for US/Canada '76 vs. '97 proprietary data (Steve Moss).

5. Biofidelity Test Review

EEVC WG 12 has taken the SID2000 report as a basis and makes recommendations to the European commission regarding future regulations.

The WG reviewed the ISO document of WG5 and started with this as a basis to produce the SID 2000 report. The SID2000 report has been accepted by EEVC WG 12.

Reviews and recommendations DOC [3] distributed to members. The committee needs to explore how to combine the SID2000 report together with the NHTSA recommendations. The committee agreed to compare and discuss the recommendations as they pertain to each body part.

HEAD

1. Low head drop - rigid impact /high head drop - padded impact

Discussion:

NHTSA would prefer to have two tests to avoid "sweet" spot

EEVC recommends dropping the high drop since the padding is no longer available and the skull should not fracture. HIC is based on fracture data therefore if the fracture test data is dropped then injury criteria will need to be reviewed.

Rigid impact excites high frequencies, lower drop without padding is actually more stringent.
IHRA Recommendation: Retain lower drop only.

2. Pendulum Test

Discussion:

THOR specs include both frontal and lateral.

EEVC is interested in THOR pendulum tests if additional data and exact test procedures can be defined.

Dominique Cesari explained that if acceleration time history is available you can do away with rebound: the members agree that we need to specify something more than just peak g to account for rebound behavior (some data may be available from Kalliaris).

Mass, location of CG with respect to OC and joint centers of rotation needs to be considered in anthropometry.

If possible future work should include oblique test data however since no oblique data is available now we should specify a frontal requirement or mid-point between frontal and lateral, interpolate between frontal and lateral for now.

A good FEM of the skull exists and oblique tests could be run.

Tasks

EEVC will review Macintosh tests for next meeting;

NHTSA will review THOR tests for next meeting;

The committee will compare the two approaches at the next meeting and decide which is more appropriate.

LATERAL NECK

7.2g Sled test based on NBDL data;

6.7g Sled test based on Patrick & Chou;

12.2 g sled test based on APR;

Discussion

NHTSA and EEVC agree on including only test 1 (drop test 2 & 3 due to insufficient sample sizes) with the exception that EEVC would like to get more data to better characterize the head and neck response.

Risa Scherer stated that 9790 gives conflicting design recommendations therefor from a design point of view limiting tests to NBDL would be preferable.

Dominique Cesari pointed out that the problem with eliminating Chou and APR tests is that you are left with only 1 test.

Note: Neck test 1 is also recommended for the shoulder. The loads included in the NHTSA recommendations refer to the shoulder.

Jac Wismans stated that neck loads are calculated from kinematics; Dominique Cesari is more in favor of referencing what was directly measured from the cadaver as opposed to a post calculated value.

Since the bending moment needs to be recorded Jac Wismans recommends that we drop the 30Nm lateral bending requirement (bullet 5)

Tasks

Rolf Eppinger believes he has additional cadaver data that includes T1 response and head neck system.

Rolf will also verify that the lateral bending moment was intentionally omitted from NHTSA's recommendations

TORSO - shoulder

Perpendicular and oblique pendulum test based on APR;

7.2g sled test based on Ewing;

8.9 m/s padded wall test based on WSU;

Quasi-static based on volunteer;

Drop tests based on APR

Discussion:

NHTSA proposes a 4" shoulder - thorax - pelvic lead low speed rigid (6.7 m/s) and high speed (8.9 m/s) padded test. A force time history is obtained for all wall segments to check that the environment is properly loaded. Additional requirements can include acceleration based, deflection based. Displacement time history can be obtained from chest bands to check the response.

NHTSA & EEVC propose to eliminate the drop tests, since they are difficult to replicate and the padding is no longer available.

EEVC proposes to keep pendulum test with impactor force/time history and maximum deflection & quasi static tests.

EEVC drops test 4 {strong coupling between shoulder and T1} keep 7.2g sled require T1 acceleration (test 2)

This is inconsistent with previous section in the SID2000 document (which has not been reviewed yet by EEVC) Jac Wismans recommends that this not be dropped. The quasi static is based on volunteer (not really a test response) ROM is more a part of anthropometry.

Rolf Eppinger would prefer to keep this test for the moment until further data can be collected
TORSO - Thorax

pendulum at 4.3 m/s test based on HSRI;

pendulum at 6.7 m/s test based on WSU;

Drop test 1 m rigid based on APR;

Drop test 2 m padded based on APR;

Sled test 6.7 m/s rigid wall test based on Heidelberg;

Sled test 8.9 m/s padded wall based on WSU

Discussion:

Question: How does flat test differ from Wayne State & Heidelberg. More load cells have been added, similar to Wayne State.

EEVC keeps pendulum tests 1 & 2, drops test 3 & 4 and keeps Heidelberg test 5 (sled) and Wayne State test 6 (sled);

In time, if the new sled tests prove to be an improvement they can replace the original sled tests.

The test procedures for the new NHTSA proposed tests need to be documented.

EEVC would be agreeable to replacing WSU & Heidelberg data with the new NHTSA data if it is acceptable;

This gave rise to a discussion on the effects of padding since WSU varied the characteristics of the padding and NHTSA used uniform padding;

Rolf Eppinger suggest making the rigid wall test mandatory and the padded test optional (rigid wall test will evaluate the impedance of the dummy).

Jac Wismans pointed out that padding results in a different load distribution and hence requires more biofidelity.

The general consensus is that it is too risky to ignore padding effect

conclusion:

The members agree to include at least one rigid and one padded impact at more than one speed.

Non-linear systems are better approximated with 2 points.

Keep pendulum test for shoulder, thorax and pelvis.

If there is nothing inherently wrong with earlier data it should not be dropped.

Tasks

Rolf will check if NHTSA tests for Wayne State configuration were conducted with the arm up or down.

Discussion continued

NHTSA data: time histories have been provided in the appendix of document 4; A 1 standard deviation corridors are preferred to straight line corridors.

At some points the corridors narrow to a width that would be extremely difficult to fit;

Time 0 marked at offset but this may be adversely affected by the morphology of the cadaver.

Corridor definition will depend on what injury criteria will be the driving factor; may need to be artificially inflated; issue needs to be looked at further.

TORSO - abdomen

1m drop on rigid armrest

2 m drop on rigid armrest

6.7m/s rigid sled test based on WSU;

8.9m/s rigid sled test based on WSU;

8.9m/s padded sled test based on WSU;

Pendulum tests at 4.8, 6.8, 9.4 m/s based on Viano;

Impactor tests based on Talantikite.

Discussion:

EEVC recommends Viano pendulum and WSU padded test only.

PELVIS

Test 1 & 2 pendulum impact at 6 and 10 m/s

Tests 3- 6 drop tests on rigid and padded surfaces

Tests 7- 9 Heidelberg sled;

Test 10-13 WSU sled.

Discussion

Drop the drop tests introduce the new NHTSA sled tests

EEVC proposes to include impactor tests, Heidelberg & WSU padded and rigid sled tests.

Rolf Eppinger will review available data to see if there is sufficient data to establish future status/ inclusion of WSU and Heidelberg data.

Concluding Tasks:

Jac Wismans will obtain a revised draft of the SID2000 document ready for the presentation at the next IHRA biomechanics meeting.

Farid Benjallal will look into available data for both lower and upper extremities.

6. Dummy evaluation methods

Jac Wismans presented dummy evaluation methods (published in an earlier IRCOBI) and tabled at EEVC WG 12;

There was general agreement that each body segment should be rated for every test independent of other segments;

Tasks

Rolf Eppinger has agreed to verify that data are still available to compare the Marcus method with the 4 methods proposed by EEVC;

Koshiro Ono will look at the methods and conduct a comparison by inputting curves and defining the merits of each.

7. Injury Criteria (Dominique Cesari)

Reviewed 3 documents from WG6 thorax and pelvis (2), dummy response (1). Propose to limit injury criteria to those body regions for which adequate data exists.

8. Other Business

EEVC proposed to have "frontal impact dummy developments" as an IHRA agenda item for the next meeting. It was agreed that EEVC and NHTSA would present their plans as a basis for future harmonization activities in this field at the next IHRA meeting in San Diego.

9. Next Meeting(s)

It is anticipated that the next meeting of the WG would be held in San Diego on October 28, 1999.

Close of Meeting

International Harmonized Research Activities (IHRA)

Biomechanics Working Group

Draft Minutes of Meeting held at Stapp, San Diego, California October 28, 1999

Attendees:

Rolf Eppinger	Chair / NHTSA
Jac Wismans	EU/EEVC WG12
Marianne Hoofman	TNO/ Observer
Dominique Cesari	INRETS/EU/EEVC
Risa Scherer	WorldSID Task Group
Farid Bendjellal	OICA/ Renault
Koshiro Ono	JARI/ Japan
Bud Mertz	OICA/ GM
Suzanne Tylko	Transport Canada/Canada
Toru Kiuchi	OICA/ Toyota
Keith Seyer	Transport & Regional Services Australia

Opening of Meeting:

The chair welcomed the delegates.

1. Acceptance of Previous Minutes:

Draft minutes for the meeting held September 27-28, 1999 in Lyon, France were reviewed:

Corrections: Farid Bendjellal 's name was corrected throughout the document.

Anthropometry

Review & follow up of previous discussions

5th & 50th percentile UMTRI data were judged to be most amenable/ appropriate for dummy design application. The external geometry of the HSRI forms (UMTRI) can be used together with RAMSES U.S./ Canada data.

In response to concerns pertaining to the discrepancies observed between the two U.S. databases, Jack Wismans confirmed that the most recent RAMSES data was the most reliable.

The RAMSES U.S./Canada data is not proprietary.

Members are in agreement to adopt UMTRI data for the 95th percentile male as well.

Missing data will be replaced with RAMSES data where necessary.

Farid Bendjellal suggests that it would be advantageous/ helpful to have a common set of anthropometric values for use by all design groups i.e.; ergonomics, dummy designers etc.

Bud Mertz explained that at GM they use dummy articulated templates, obtained from the Hybrid III dummies.

Review tasks to be completed

Keith Seyer will prepare a summary document for anthropometry.

Biofidelity Test Review

Review tasks to be completed

HEAD

Rolf Eppinger will prepare a summary of the THOR pendulum tests.

LATERAL NECK

Rolf Eppinger will check to see if additional cadaver data that includes T1 response and the head neck response are available.

Rolf will also verify whether the lateral bending moment was intentionally omitted from NHTSA's recommendations

Bud Mertz believes that there is more data available through Wayne State. The data are part of the data set for Test 2 by Patrick & Chou completed 25 years ago. There were apparently 10 volunteers in the original program. There are some oblique results available as well.

TORSO

Rolf Eppinger will confirm arm placement for Wayne State sled tests;

Rolf will clarify Heidelberg test fixture re apparent slight angulation of the plates.

PELVIS

Jac Wismans will obtain a summary of the SID 2000 document for presentation to the committee.

Farid Bendjellal will try to access data for upper and lower extremities.

Dummy Evaluation Methods

Jac Wismans, Bob Hultman, and Prya Prasad are considering setting up a new committee concerning computer model validation. Also related to WG5 and WG1 activities (one-dimensional models).

Review tasks to be completed

Rolf will check that the data are still available to compare the Marcus method with the 4 methods proposed by EEVC.

Koshiro Ono will compare the proposed methods and provide a critique to committee members to assist in the selection of an acceptable methodology.

Injury Criteria

Dominique Cesari has collected injury curves for the thorax and pelvis and observed that the sled test risk is very different from the pendulum test: Dominique recommends separating the risk curves for the sled and pendulum.

Summary of data to data

pelvis 2 curves

head frontal only, HIC. There is potential for a kinematic criteria.

neck kinematic response only

abdomen still looking into this

Review tasks to be completed

Dominique will prepare a summary for presentation at the next meeting.

New Business

Jac Wismans described current EEVC (and European) activities regarding the future frontal impact dummy (European contribution to THOR) and proposed that the IHRA Biomechanics work item. The role of the committee would be equivalent to that currently assumed with respect to WorldSID and would ensure harmonization of any future frontal dummy developments undertaken by the European community.

The Chairman agreed to take this into consideration.

EEVC and NHTSA will present their future plans in this field at the next IHRA meeting, in order to define a common strategy.

Next Meeting

Proposed date & place: February 11ⁱ 1 Madrid, Spain.

Alternative: March 6 at SAE Detroit.

SUMMARY OF TASKS TO BE COMPLETEDⁱⁱ2

ROLF EPPINGER

Prepare a summary of the THOR pendulum tests;

Check to see if additional cadaver data that includes T1 response and the head neck response are available;

Verify whether the lateral bending moment was intentionally omitted from NHTSA's recommendations;

Confirm arm placement for Wayne State sled tests;

Clarify Heidelberg test fixture set-up re plate orientation;

Check that the data are still available to compare the Marcus method with the 4 methods proposed by EEVC

BUD MERTZ

Check availability of volunteer data dating back to the Patrick & Chou experiments;

Check availability of oblique data.

JAC WISMANS

Obtain the revised draft of the SID 2000 document for presentation to the committee;

FARID BENDJELLAL

Access data for upper and lower extremities.

KOSHIRO ONO

Compare the proposed dummy evaluation methods and provide a critique to committee members to assist in the selection of an acceptable methodology.

KEITH SEYER

Prepare summary of anthropometry resolutions.

DOMINIQUE CESARI

Prepare a summary of all available/ proposed injury risk curves for presentation at the next meeting.

DANIUS DALMOTAS

Prepare review of field accident data for the next meeting.

i₁ IHRA Side Impact scheduled for Feb.7 & 8, WorlSID Feb. 9&10 2000.

ii₂ *Compiled from previous minutes*

NHTSA Side Impact Harmonization Efforts



Short Term NHTSA/TC Effort

- In response to auto industry petition to use Eurosid concept
- Evaluates Eurosid design changes addressing identified performance deficiencies
- Compares dummy with bio response targets

Long Term IHRA Bio Working Group Effort

- Seeks world-wide consensus on:
 - Anthropometry
 - Field Injury Prioritization
 - ATD Dynamic Response Requirements
 - Injury Criteria and performance limits

Side Impact Dummies

Eurosid



SID



BIOSID



SID-IIs



Eurosid-1 - Background



- **NHTSA conducted 8 tests, on US Vehicles, according to the EU side impact test procedure**
 - “flat-top” rib responses were observed in all tests
- **To further research the flat-top phenomenon, NHTSA conducted 57 high mass impactor tests on the Eurosid-1**
 - Eurosid-1 was modified with ASTC rib modules and TNO Research Kit
- **Transport Canada conducted repeat tests with the modified Eurosid-1, and flat top was still present**

Eurosid-1 - Background

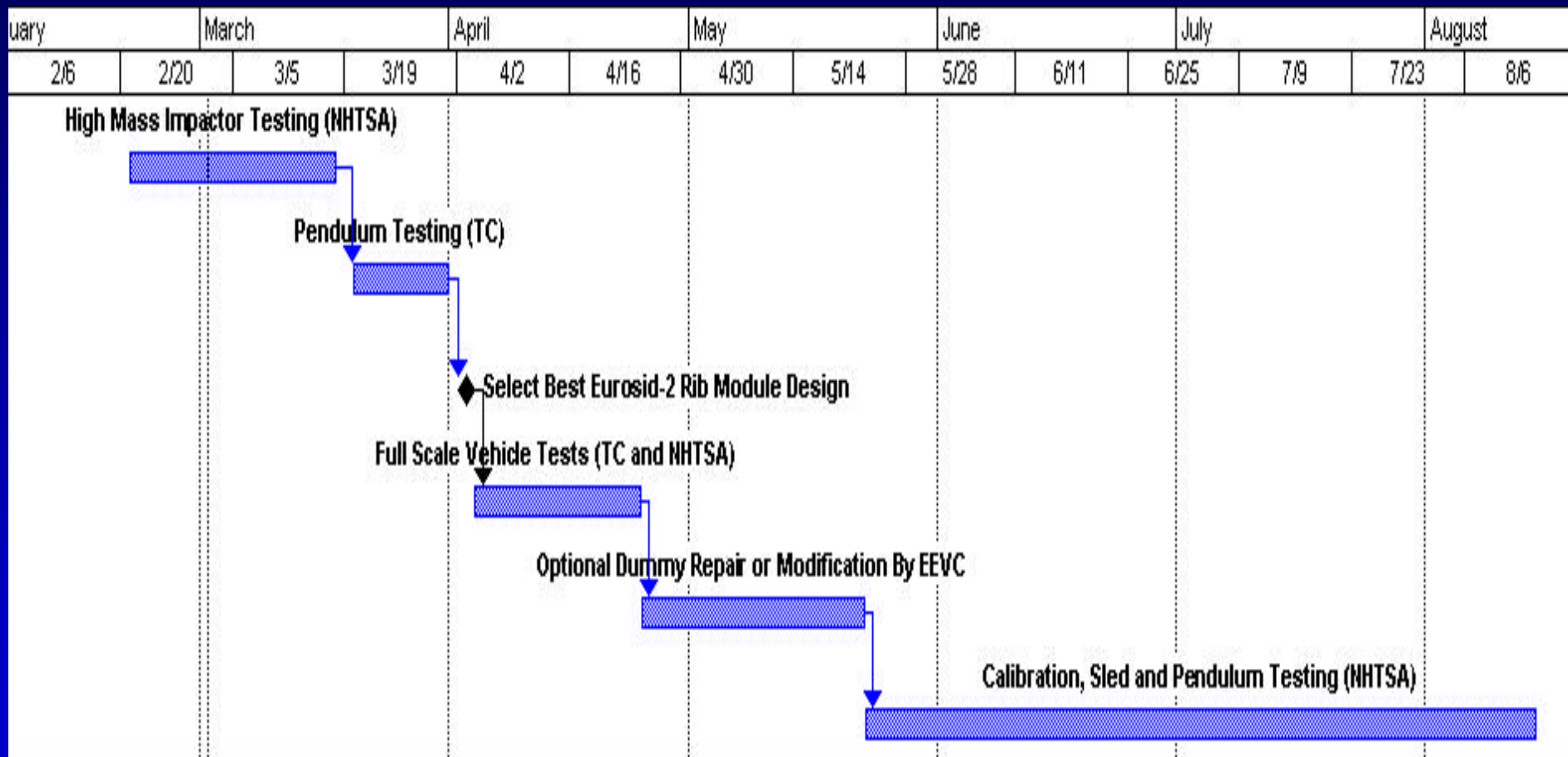


■ **NHTSA concludes**

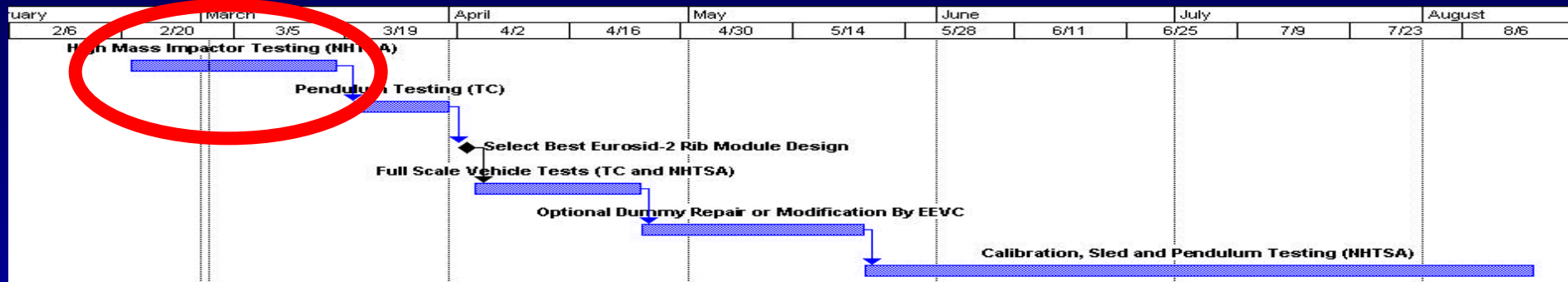
- modifications to reduce bearing surface friction in Eurosid-1 Rib Modules reduces flat-top duration
- flat-top phenomenon may also be caused by elements of the Eurosid-1 design outside the thorax, possibly the shoulder.

■ **EEVC takes on development of Eurosid-2 Dummy**

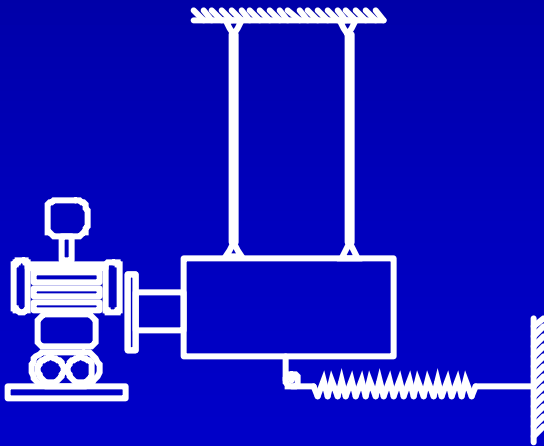
Eurosid-2 Testing



Eurosid-2 Testing

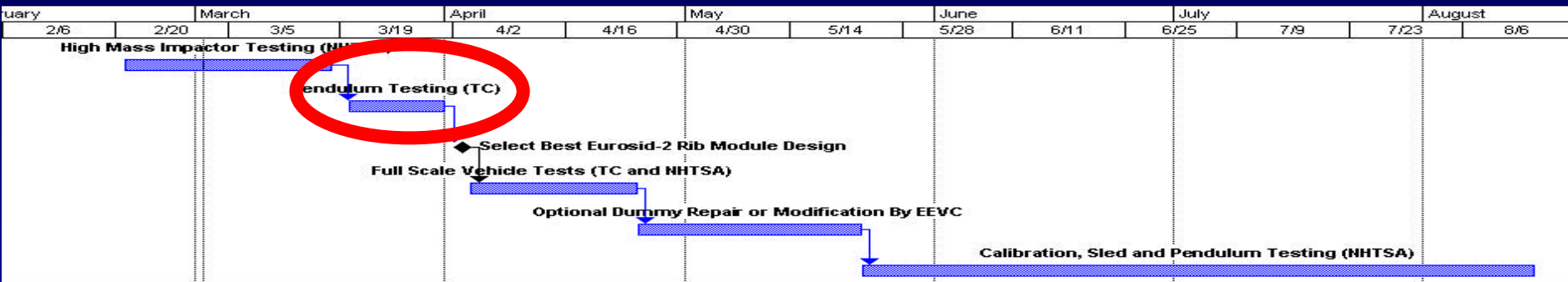


High Mass Impactor Testing (NHTSA)

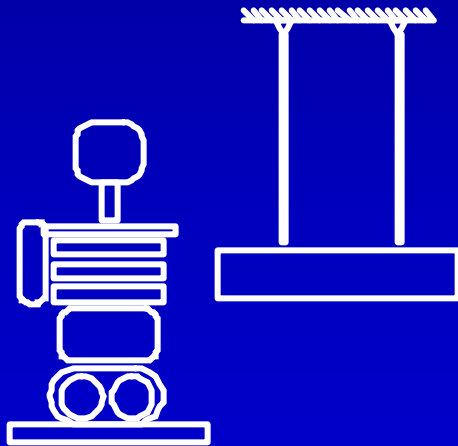


- 907 kg pendulum, 5.5 m/s closing speed
- contact with abdomen, thorax and arm
- multiple angles in horizontal plane from 20 degrees forward to 15 degrees rearward

Eurosid-2 Testing

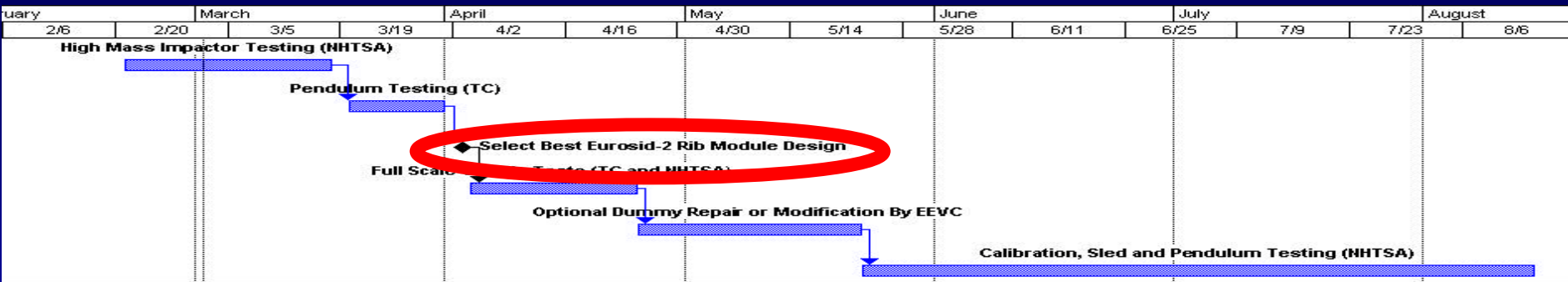


Pendulum Testing (TC)



- 45 kg pendulum, 6 m/s closing speed
- contact with thorax
- multiple angles in horizontal plane from 30 degrees forward to 30 degrees rearward

Eurosid-2 Testing



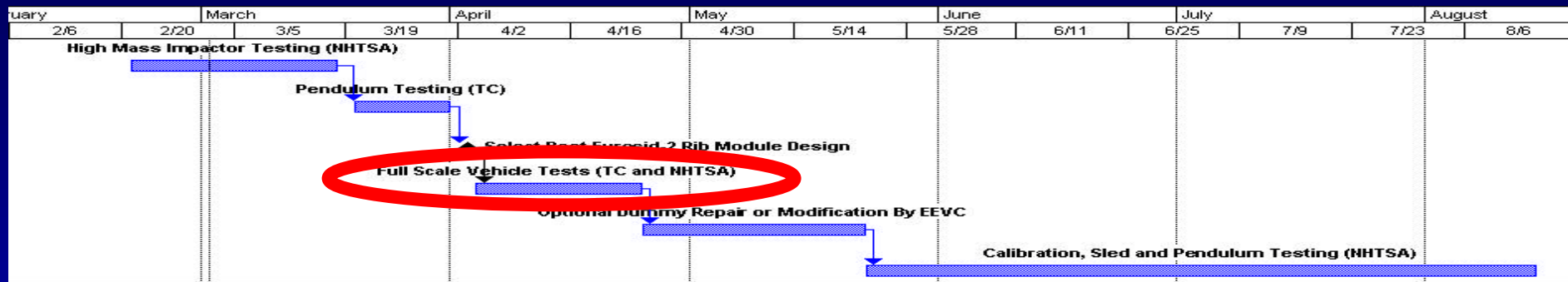
Select Best Eurosid-2 Rib Module Design

- Coated piston design
- Needle Bearing design
- Ball bearing design



NHTSA Recommended
Rib Module Design(s),
if any.

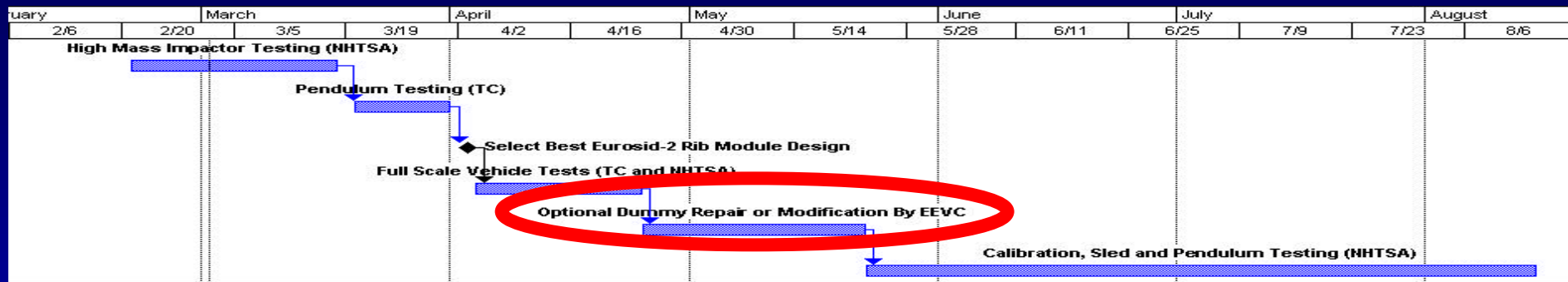
Eurosid-2 Testing



Full Scale Vehicle Tests (TC and NHTSA)

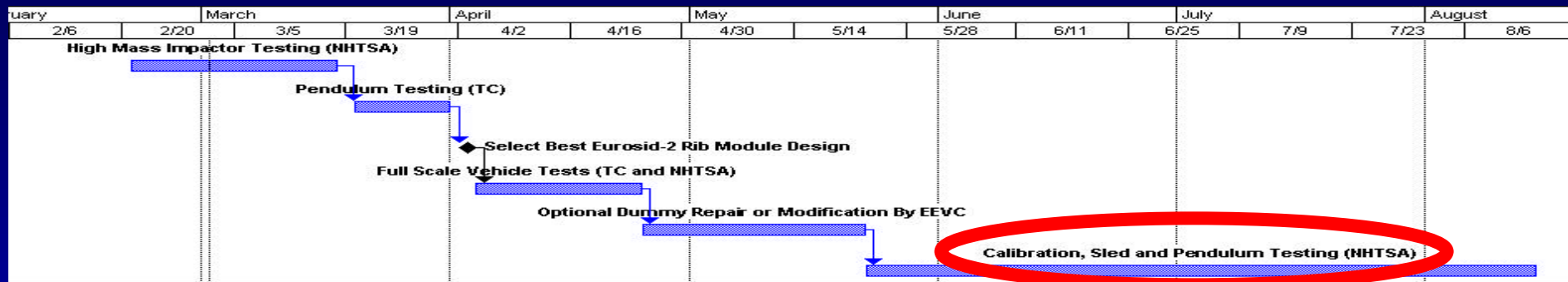
- 2 tests conducted in the EU test condition
 - same vehicles where flat-top was observed in tests with the Eurosid-1
 - front seat and back seat occupants
- 2 tests conducted in the NHTSA FMVSS 214 condition

Eurosid-2 Testing



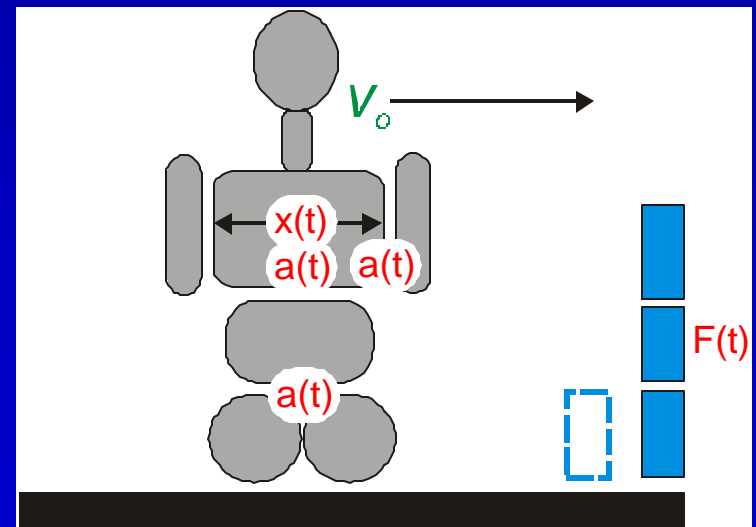
Optional Dummy Repair or Modification by the EEVC

Eurosid-2 Testing

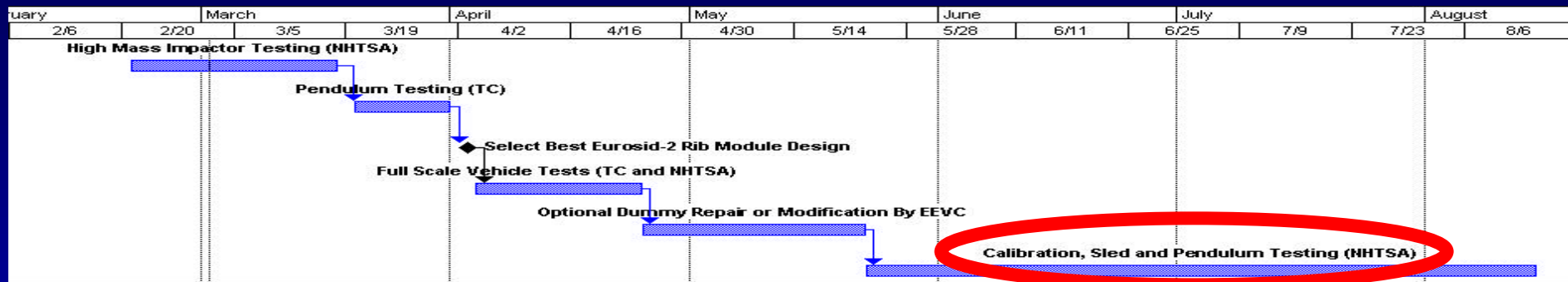


Calibration, Sled and Pendulum Testing (NHTSA)

- speed - 6.7 and 8.9 m/s
- padded and rigid wall
- pelvic, abdominal, and thoracic offset
- oblique impacts

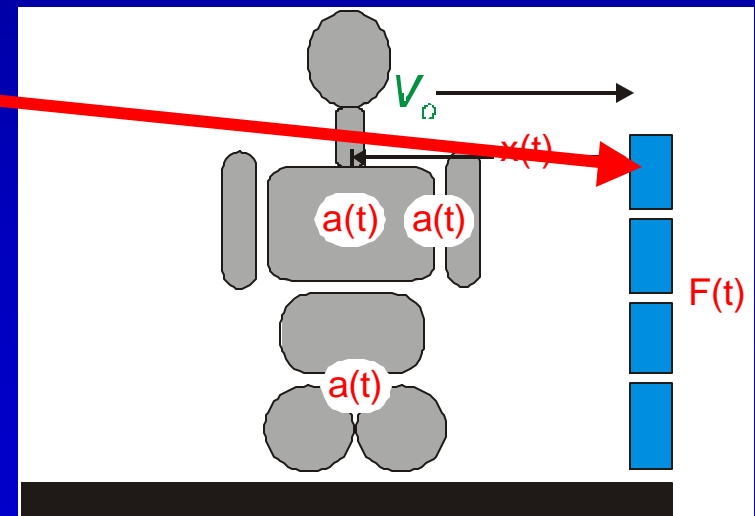


Eurosid-2 Testing



Calibration, Sled and Pendulum Testing (NHTSA)

- load walls with and without shoulder plate
- Compare force, acceleration and displacement measurements with cadaver tests
- Compare with other dummies (SID, BIOSID, SID-IIs)



Eurosid-2 Testing



- **Shoulder - fundamental design of Eurosid-2 shoulder is the same as the Eurosid-1**
 - Many within NHTSA feel this rotating shoulder design is a cause of flat-top
 - Other non-rotating shoulder design concepts are available and could be incorporated into Eurosid-2 (BIOSID/SID-IIs)

Eurosid-2 Testing



■ **Eurosid abdomen is too narrow**

- The Eurosid-2 thorax is wider than the abdomen in the lateral direction. This is not representative of the 50th Percentile male in the United States.
- The reduced width of the abdomen will cause the inner door to engage the dummy abdomen later in the event, than would the seated 50th percentile male abdomen be engaged.
 - Hence, because of surface geometry differences, the dummy abdomen may “miss” a portion of load directed into the would-be human occupant.

Report on the 17th ESV Conference
Geneva, Switzerland
March 9, 2000

Transcribed from hand written notes of Gerard J.M. Meekel, ESV Government Focal Point, and Host of the 17th ESV Conference, Amsterdam, The Netherlands, June 4-7, 2000.

ESV - UPDATE

10-3-2000

1. Information Exchange by E-Mail

2. Time Schedule ESV - 17

- Day 1:
 - Official Opening
 - General Manager RDW
 - Minister MOT
 - NHTSA: Ms. R. Millman
 - Awards - NHTSA
 - Status Reports - GFP
 - Invited Speaker Session (Chaired by ??)
- Day 2-3-4:
 - Technical Sessions

3. Translations :

Day 1: French, English, German, & Japanese
Day 2+3+4: English Only

4. Poster Sessions:

Day 1: Awardees
Day 2+3+4: Technical, Depending on TS Items

5. No Special Student Session:

- To be Integrated in all T.S.s
- To be Promoted by GFPs

6. Chairperson of T.S:

- IHRA Chairpersons ?
- Proposals based upon received reactions to be made by GM

7. Technical Sessions:

- Oral presentations
- Poster presentations
- Written presentations

8. Social Events:

- Day1: Welcome reception
- Day 3: ESV - Conference dinner (Max 800 Parties:)

9. Social Tours:

2 planned

10. Technical Tours: On Day "5"

- TNO - Automotive
- DAF factory + DAF museum
- RDW/TCL + Old ship under construction

11. Conference Fees:

Separated for:

- Conference
- Dinner

12. Exhibition:

~ 850 m² Available (in modules of 9 m²)

13. Lunches:

Buffet, to promote visit to exhibition

14. Hotels:

- Preliminary reservations have been made
- Information about cheap youngster hotels will be in 2nd Announcement

15. 2nd Announcement:

- Scheduled for July 2000
- Including:
 - General information
 - Rough schedule for day 1-2-3-4
 - Tours (Social + Technical)
 - Registration form
 - Call for papers

16. Separate Issue on "Exhibition Information"

17. Promotion/Distribution of Items 15 and 16 above:

- Several Sources:
 - ESV - 16 List
 - ECE (WP 29 + GRs)
 - EAEC List
 - ACEA
 - National "SAE" contact points in countries
 - GFP contact points

18. Final Proceedings:

- No paperwork during TS

IHRA Meeting Report on ESV, March 2000

- Book of abstracts in ESV Bag
- Final proceedings: Only CD ROM in ESV Bag

19. Website:

www.esv2001.com
www.esv2001.nl

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